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Oxy-Acetylene Welding by Machine

Recent Developments Have Extended Scope to 8-In. Pipe, to Flat Sheet Metal, and to Joints in Steel Plate Up to 3/8-In. Thick

BY J. L. ANDERSON*

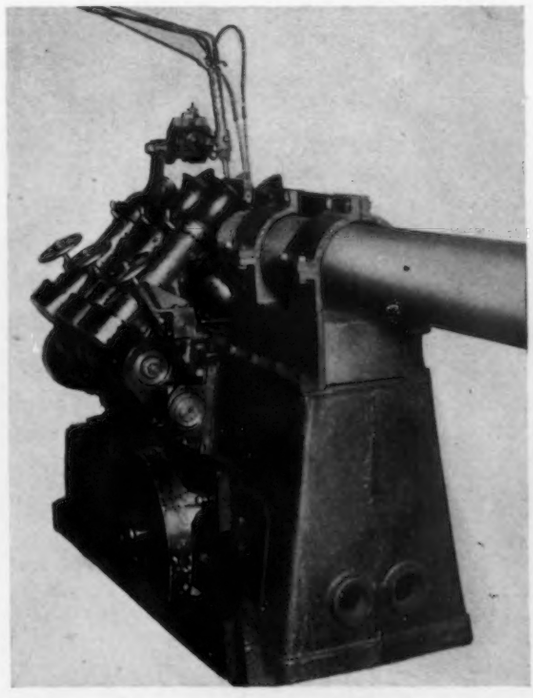
COMMERCIAL adaptation of the oxy-acetylene welding process to mechanical operation began about 1910 with the manufacture of steel tubing from steel strip of required width. Early costs were high, but since the only competition was from much more expensive seamless drawn tubing, a new industry was developed. Today, there are in this country over 350 oxy-acetylene tube welding machines divided among 36 companies engaged in manufacturing welded tubing and products fabricated therefrom.

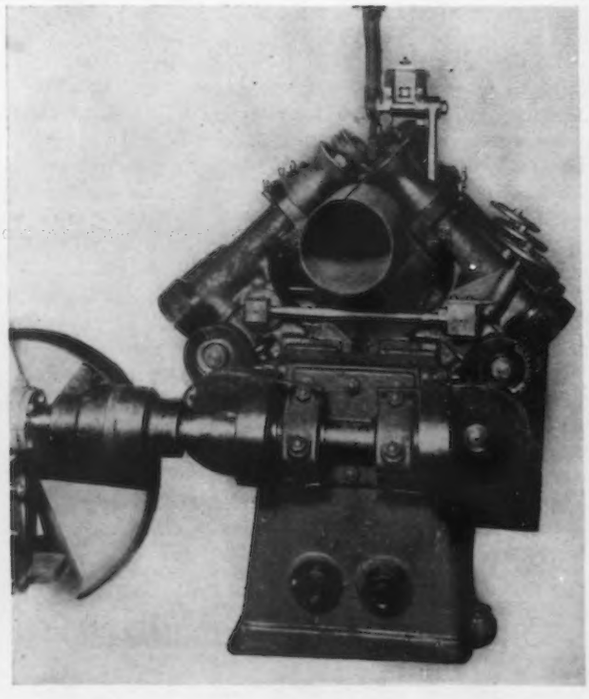
Equipment used for this work has been described so frequently that it is fairly well known. Improvements, of course, have been continuous. Comparative production then and now on the same light-gage tubing is as follows:

	Performance in 1915	Production of Latest Machines
Number of flames per tip.....	4 or 5	max. 20
Acetylene burned per hour.....	max. 40 cu. ft.	90 to 100
Production, feet per hour.....	150	600 to 700

Diameters and thicknesses have increased to 24 in., 10

*Abstracted from a paper presented before the International Acetylene Association, Chicago, Dec. 15, 1928. The author is connected with the Research Engineering Department, Air Reduction Co., Inc., New York.





Figs. 1 and 2. Entrance and Delivery Sides of Machine for Making 8-in. Pipe With 3/16-in. Wall By Oxy-Acetylene Welding

gage; such pipe is made at the rate of several hundred feet per day per machine, with very low labor cost. The development of the welded steel tube has thus gone into the field of seamless tubing, and furnace welded tubes, having heavy walls and of large diameter. Today, we see machines producing long length tubing 8 in. diameter and approximately 3/16 in. thick, in competition with the more commonly known lap welded pipe. Figs. 1 and 2 show such a machine. Accurate and individual control of the pressure given by each set of rolls is a prominent feature.

An outline of some of the steps in the above development will indicate how mechanical welding with the oxy-acetylene flame has extended itself to sheet steel generally, and more lately to plate up to ¼ in. thick.

As competition in the manufacture of welded tubing developed a demand arose for more footage per hour, and naturally the first efforts were made along the line of forcing more gas through a given sized tip. The limitations of this procedure were soon realized; nevertheless, speed increased 50 per cent or more, often at the expense of quality. During this development attention was paid to the forming or fabrication of the tubing preparatory to welding. Heavier forming mills with more stands of rolls and with the provision for adjustments of tools in all directions were provided, resulting in open-seam tube with tolerances of only 0.005 in., seams perfectly straight and edges properly shaped and positioned. Greater accuracy in preparation was responsible for higher weld quality and economy in manufacture. Holding jigs were also changed to permit greater heat inputs, and the machines made stouter, more accurate and steadier in operation. Soon it was demonstrated that more heat could be used to advantage, and multiple tip torches were developed.

When an attempt was made to extend this process to flat sheet rather than curled strip, it was quickly learned by every one that this was a totally different problem. Heat application was more critical, and apparatus that produced at satisfactory speeds on tubing, welded at a considerably lower rate when applied on this type of production. Among the requisites of a successful welder on sheet steel products the following may be mentioned:

a. Parts must be accurately and uniformly prepared.

b. Clamping arrangements must be accurate and rapidly opened or closed.

c. Accuracy of clamps must be independent of heat.

d. Clamps must not interfere with welding flame of sufficient size.

e. Clamps must not grip welded joint so tightly as to prevent contraction during cooling.

f. Machines must be adjustable for length of seam and thickness of sheet.

The last feature is essential when parts of the same form and dimension but varying in thickness are to be welded in the same jig. Heavier sheets require a greater spacing between the clamped edges, in order that the flame may come in contact with sufficient surface so that conduction loss into the jig be reduced to a minimum. Adjustability should therefore be provided in both upper and lower clamp members. The depth and the amount of the space between clamps for movement of the welding equipment must secure the required clamping effect and yet not interfere with torch operation or the visibility of the operation.

These features have been worked out in many different forms, more or less complicated, according to the ideas or experience of the designer. One very satisfactory design, used for short tanks or barrels, is shown in Fig. 3, and some details in Figs. 4 and 5. At the right of Fig. 3 is a work-holding turret; one set of clamps is open to receive work. Each clamp is hinged at the inner end and is provided at the outer end with a cam-actuated latch. Eccentric pins are provided at both the hinged end and the latch end to permit the clamp to take sheets of various thicknesses.

The arms on the turret are 180 deg. apart; while one holds the work in position for welding the other can be unloaded and loaded for the next weld. A stop, released by a foot lever, brings the arm to rest in the proper position. Torches are arranged for welding from either or

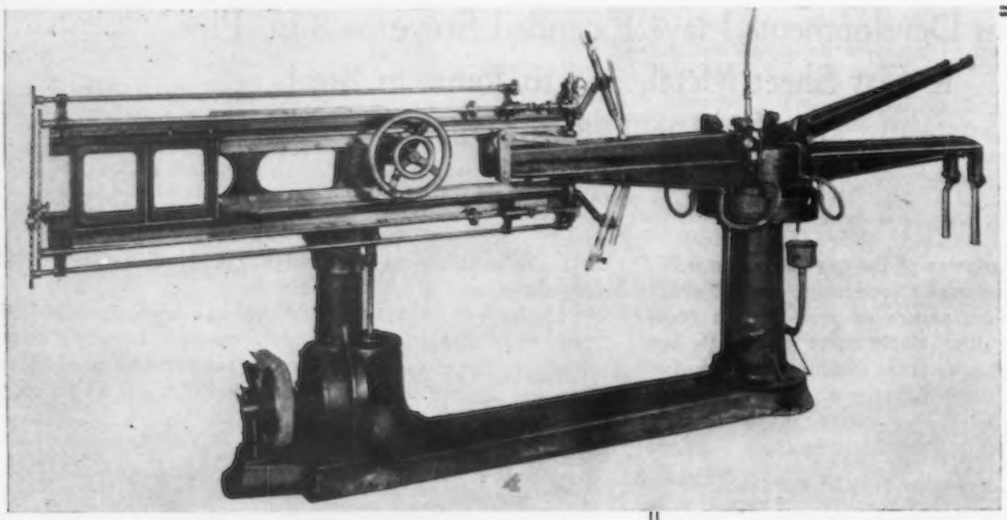


Fig. 3—General View of Machine for Welding Thick Sheet or Thin Plate Simultaneously from Both Sides

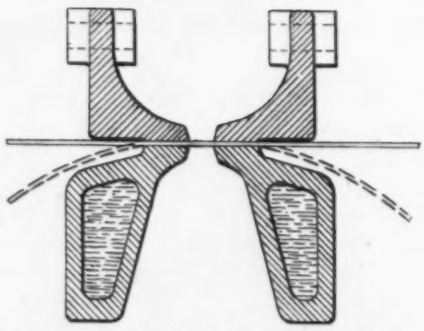


Fig. 4—Section Through Water-Cooled Welding Clamps

both sides. Slow traverse during welding is motor controlled; automatic stops, cut outs and quick returns are incorporated in the propelling frame. Torch adjustment may be made either vertically or at right angles to the line of the joint.

In welding with this machine, as in all mechanical welding operations, it is of primary importance that the sheets be accurately sheared and correctly set up.

In shops that are equipped to do accurate straight shearing, edges are commonly cut straight so as to be in abutment throughout the entire length. In placing such sheets in the clamps preparatory to welding, it is necessary to butt them at the starting point, and to spread them apart at the end of the weld; this spacing is to allow the sheets to move under the influence of the heat, and finally come together as the torch completes the weld.

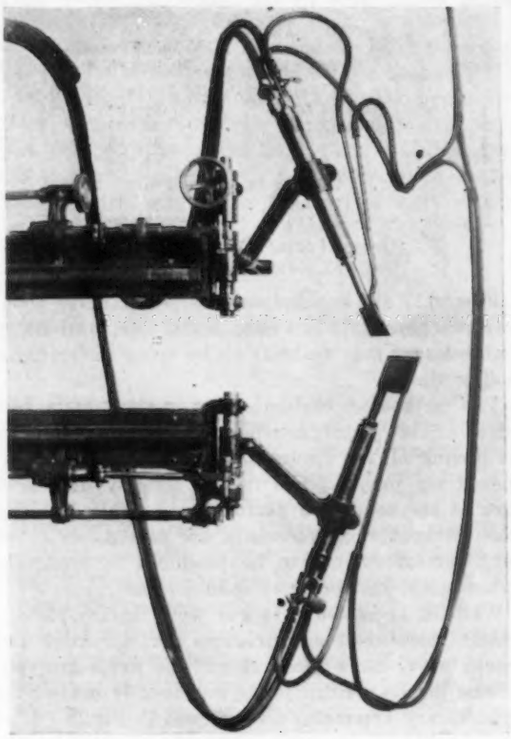


Fig. 5—Close-Up of Multiple-Flame Welding Tips for Welding Thin Plate

The amount of this spread is dependent on the speed of torch travel and on the size of the flame—in other words, on the rate of heat transfer. A constant ratio of gap to length of seam may be utilized for all gages within the range of a machine by choosing the proper speed and size of gas flame; a practical figure is approximately 1/16 in. for a 36-in. seam.

Another method requiring less care in shearing and in set-up, applicable when moderate accuracy in final dimensions is required, consists in shearing the sheet so the edges are slightly concave. The sheets so sheared are clamped in the jig with their edges in abutment only at the ends.

Welding From Below the Seam

When welding 14-gage sheet, or thinner strip steel, satisfactory joints are made with a flame on the upper surface of the seam. Thicker metal is welded to better advantage with two blow pipes, one above and one below the plate. In fact, best results are ordinarily obtained by generating more than half the heat by the lower torch.

At first thought it may seem that welding on the under surface with a large tip would be difficult and uncertain. As a matter of fact, very fine welds can be made in this way, and very thorough penetration secured on material up to 10 gage thick. It is quite a simple matter to judge the performance of the lower torch by the appearance of the metal on the upper surface.

Everyone who has witnessed a mechanical gas welding operation has noticed the area of heated metal which surrounds the molten puddle but which is covered by the envelope or secondary flame. When welding from the underside, this heated area that moves along the seam with the progress of the torch is much more clearly defined. There is no glare from the high-temperature flame and the fluid metal. When heat is concentrated along the underside of the seam, and the operation viewed from above there is in the center of the heated zone an elongated spot which on the upper surface is just short of the welding temperature but scintillates, thus indicating clearly the position of the weld and the depth of penetration.

The upper torch is merely required to fuse the metal

Fig. 6—Top View of Reinforced Machine-Made Weld in ¼-in. Steel Plate

Fig. 7—Lower, Broader Reinforcement of ⅜-in. Plate Made by Proper Disposition of Welding Flame

Fig. 8—Bottom Side of Weld Shown in Fig. 7

just deep enough so there will be an overlapping of the two welds. For this reason, coupled up with the fact that this torch works on preheated metal, a comparatively small amount of heat is required on this surface.

There are several advantages in this method of welding. The main one is economy. The secondary flame of a torch held underneath the work impinges on and spreads along the seam much more completely than when applied from above, giving up much of its heat to the sheet. Due to this greater absorption of the available heat more speed can be secured from the combustion of a given amount of gas. If the same amount of gas were burned on the upper surface, a smaller proportion of this heat would be absorbed while the flame is in contact with the sheet.

The operator is thus protected from the bulk of the heat and can pay more attention to the work. There can be no question as to the thoroughness of the operation, because it is easy to see when the seam is welded completely through.

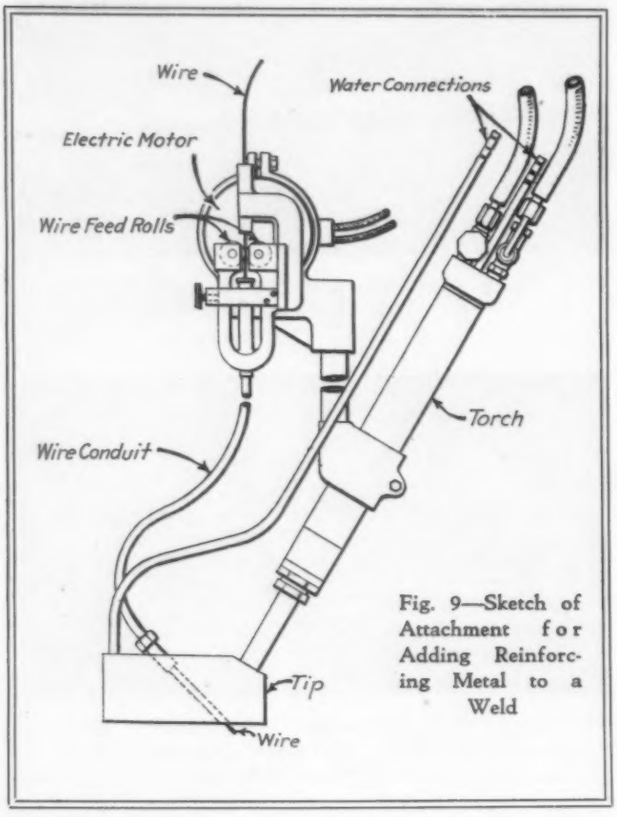


Fig. 9—Sketch of Attachment for Adding Reinforcing Metal to a Weld

Another marked advantage is in the enhanced quality of the joint. Numerous tests have indicated that the strength and ductility of the weld are almost equal to those of the base metal throughout the length of the seam.

This is due to some extent to the more uniform heating of the surrounding metal, and from both sides, which prevents any chilling effect as the metal solidifies. A more important factor is the ability to produce welds with a minimum of surface oxidation and included impurities. This is the result of the complete blanketing of the fused and heated metal on both surfaces by the products of combustion, mainly hydrogen and carbon monoxide, both very active reducing agents.

Tests with equipment using torches and tips of large gas burning capacity prove that welding speeds on 12-gage steel are in excess of 360 ft. per hr. It is unusual to find products having seams of great length in sheet and plate metal production that would afford opportunities to employ the maximum welding speeds known to be possible. The exception to this statement is found in pipe production. In this connection it may be well to say that welding speeds are often governed by the design, construction or operation procedure of the machines rather than the limitations of the welding process. We are, therefore, often compelled to reduce the production on 12-gage material so as to produce welds at speeds ranging from 25 in. to 36 in. per min., because of some limiting factor in no way related to the welding method.

Automatic Welding of Plates

During 1928 gratifying results have been secured by applying the principles above outlined to the welding of steel plate up to ⅜ in. thick. With torches consuming 3.3 cu. ft. oxygen and 3.2 cu. ft. acetylene per min., plain butt welds can be made in ¼-in. steel plate at the rate of 24 in. per min., and in ⅜-in. plate at 11 in. per min. Closely fitted sheared edges, butted closely together, need no further preparation when welded simultaneously from both sides. The quality of the work done under shop conditions is indicated by the following tension tests:

Coupon Number	Ultimate Strength, lb. per sq. in.	Yield Point, lb. per sq. in.	Elongation, per cent in 8 in.
	Welds in ¼-In. Plate		
1	54,600	38,160	31
2	53,160	35,480	28
3	55,020	36,060	27
4	54,000	35,420	28
	Welds in ⅜-In. Plate		
1	57,960	34,400	15
2	59,110	35,530	14
	Original Steel Plate (⅜-In. Thick)		
	59,300	36,200	19

Figs. 6, 7 and 8 show various seams made with one of these machines. It has been found that various types of reinforcement may be built up by using different forms of welding tips.

The method of welding seams in sheet metal, described earlier in this paper, considered only multi-flame welding tips having all the flames arranged in a single row. This type of tip projects the flames directly on the sheared edges of the seam and performs very satisfactorily when welds without reinforcements are acceptable or where a slight reinforcement can be produced by controlling the molten metal just prior to solidification.

While it is practical to gas weld thicker plate by this method, there are many products that for sales and other reasons prove more acceptable if the welds are reinforced to some degree. Such joints are readily made by mounting auxiliary apparatus as sketched in Fig. 9. It consists of a variable-speed motor with suitable reducing gearing, rolls to feed and straighten the welding wire, and the necessary control equipment.

There must also be provided a tip which will distribute the heat so that the metal in the seam will be thoroughly melted and the rate of melting be so controlled that the added material (which will be semi-plastic) will not disturb the weld metal in the seam edges. The tip must also provide the heat necessary to preheat preparatory to welding, and to fuse the added wire at a rate which will produce a reinforced weld of any desired dimension commensurate with the thickness of the steel.

This is very satisfactorily accomplished with a tip in which there are two rows of flames more or less parallel, between which is introduced the welding rod. By this method the heat is applied at a distance from the edge dependent upon the thickness of the metal. The loss by conductivity into the body of the sheet is automatically controlled, and the absorbed heat builds up toward the meeting edges. The seam does not overheat because the edges are not in direct contact with the high-temperature cones, but are in a position to absorb heat by radiation from the high-temperature cones on either side and by convection of the superheated products of combustion in the zone between the flames.

There are usually a number of flames in addition to the

double row which are so placed that sufficient force is exerted upon the melted metal to spread the metal so that it may present the desired contour when it solidifies.

During the passage of the flames over the seam the metal melts deeper and becomes more fluid with the impingement of each succeeding flame, and the metal in the edges gradually flows together into a single elongated puddle of fluid metal. The depth of penetration can be very closely determined visually. The first evidence of fusion is that given by the metal along the edges of the seam taking on a glossy appearance, beginning with a line and gradually spreading over the entire edge surface that is directly under the rear flames of the welding tip. The depth of fusion increases until the impact of the gases is able to make a depression in the surface. Each succeeding flame moves more metal, and as the metal increases in fluidity waves are formed that increase in depth, height and width as the tip progresses.

Due to the fact that the impact of the flames is upon solid metal rather than on the more or less imperfectly abutted edges of the sheets, higher pressures can be carried on the gases and more gas burned per flame with less danger of melting through, consequently the operation is less critical and higher welding speeds can be attained.

It is a well recognized fact that in a properly operated blowpipe only sufficient oxygen is introduced to consume the carbon of the gas while the hydrogen is released, spreads out and unites with the necessary atmospheric oxygen. Due to the close spacing of the double row of flames, a considerable portion of the hydrogen released *between* the flames finds no oxygen in that confined space; consequently it protects the metal; the resulting weld is, therefore, free from oxides, and extremely ductile.

Experience seems to indicate that welding tips having twenty to thirty flames burning 100 cu. ft. of acetylene per hr. are satisfactory for operations up to ⅜ in. thickness, depending, of course, on the amount of heat applied from the under side of the plate.

When heavily reinforced welds are required, the flame distribution is modified as may be necessary in order to secure a smooth reinforcement, tapering off gradually into the sheet at each side. As in all other welding operations best results are secured when the diameter of the wire added for reinforcement is varied in accordance with the thickness of the material to be welded.

Mention was made of the limitations imposed by machine design upon welding speed, and it may be well to say in conclusion that at present we do not know what the limit of production speed for mechanical gas welding may be.

We do know, however, that with machines designed to permit continuous operation under high-temperature conditions, welding speeds far in excess of any present-day commercial applications are entirely practical.

What Makes a Good Foundry Apprentice?

A NEW slant on the problem of foundry apprenticeship was developed at the foundry conference recently held at the University of Wisconsin. In four days a representative group of operating men considered many phases of the problem in round table discussions, where comment was free and spontaneous.

At the very first an interchange of views was had on how to attract desirable recruits and how to induce more foundries to give some attention to training of young men. Many difficulties were considered. Among them was the problem of giving proper training in foundries doing an extremely limited line of work. It was suggested that this objection might be overcome by cooperation between various shops, each producing a restricted line of work, but together providing a sufficient variety to justify an apprenticeship. Apprentices could circulate through the different cooperating shops in the course of their training.

The aversion of most boys and young men to the dust and dirt in foundries was also considered and declared to be the result of a reputation which the industry has but which is no longer justified. Most foundries are making an honest attempt to improve working conditions and noteworthy results have been achieved. At the same time a certain amount of dirt appears to be inseparable from foundry operations. Since the number of applicants for apprenticeship in the foundry is restricted, those who do come have less competition for promotion. This should be a special inducement.

The contention that machine molding methods have done away with the need for skilled men was repudiated for the reason that machine production operations must be very carefully supervised by skilled men of the highest caliber, even though the number of such men required in a production shop is undoubtedly less than in a jobbing shop.

An answer to the question, "What may an employer justly expect of the graduate of a four-year foundry apprentice training course?" was formulated. The question may be phrased in other words: if an apprentice graduate applies for work in a foundry, what work may he be assigned to and what work cannot be expected of him? At the end of the session the group had agreed that the following could justly be expected:

1. General molding skill on the floor, in green and dry sand, and on the bench.
2. General skill in core making, both bench and floor.
3. An understanding of melting operations, although not skill in them.
4. Knowledge of the control and preparation of molding sand.
5. A general knowledge of the scientific facts and principles upon which the industry is built.

Minimum requirements of an adequate foundry apprenticeship were also considered. A formal indenture or agreement between the employer and the apprentice is practically necessary for proper control and for success of the program. Proper shop supervision and instructions (that is, responsibility for the teaching and control of apprentices to be placed upon one or several individuals), were declared to be necessary, as well as suitable arrangements for theoretical or related trade instruction.

Helping molder, green and dry sand molding, bench molding, core making, cupola or furnace operations and casting inspection were called essential in an adequate program of foundry apprenticeship.

Finally, the group attempted to specify the conditions which must exist in a plant before apprentice training may be successfully undertaken. Of these the following are the most important:

1. The conviction and enthusiasm of the management.
2. A careful survey of the facilities for training provided by the shop in question.
3. The laying out of a careful plan of training and machinery for its administration.
4. The conviction and enthusiasm of the foremen, department heads and other supervisory officials.
5. Placing responsibility for the work.
6. Schedules of work and pay.
7. Suitable school courses and arrangements for teaching them.

Basic Open-Hearth Furnace Yields

Influence of Various Types of Losses and How They Should Be Calculated—Duplex Operation Considered Separately

BY C. D. KING*

IN discussing basic open-hearth yields, reference is made to the ingot yields obtained in the process of converting pig iron, scrap and ore into steel. In this conversion some scrap is produced. The difference between the total weight of ingots and scrap produced and the original metallic charge constitutes the loss.

Basic open-hearth yields vary considerably. While some of the divergencies can be explained metallurgically because of differences in slag analysis, proportion of pig charges and character of steel made, there often remain differences that apparently do not readily disclose themselves. In reconciling yields by the usual accepted methods of calculation, one is often forced to evaluate large losses as "unaccounted for." Such a system is prone to accept these large losses as inherent to the operation and not susceptible of appraisement and correction.

It is obvious that if the ingot yield, plus the scrap recovered, subtracted from 100 per cent, determines the loss, a drop in yield may follow increase in the loss or in the scrap, and both contribute a monetary loss. To be sure, one can subdivide these unaccounted for operations with reasonable accuracy. A method of yield calculation which would disclose departures from normal good practice is therefore welcome to the open-hearth operator, in affording him a rapid and accurate check on yields to be obtained for different conditions.

Influence of Estimations

As normally considered, the gross metallic charge is made up of pig iron, hot or cold, iron scrap, steel scrap, iron in ore, scale, etc., and additions. In the sense in which additions are treated in the discussion, they are the pure metallic manganese, silicon, vanadium, etc., of the ferroalloys used, the iron content being deducted and shown under pig iron. Deducting, from gross metallic mixture, all the scrap recovered such as iron scrap, pit scrap, skulls, ingot butts, condemned ingots and, where open-hearth slag is used in blast furnaces, the metallic contents thereof, one arrives at the net metallic mixture.

In any well-managed open-hearth plant the gross metallic mixture is weighed with reasonable accuracy, all the scrap practical to recover is accounted for and duly credited, and the ingots are accurately weighed. Estimated weights for any major portion of the metallic charge must result in fictitious yields for individual heats, some abnormally high and others unduly low. Such practices result in large adjustments at intervals, to balance materials on hand, and as a result the yield reported is seriously disturbed. Even with the most careful weighing, minor adjustments are necessary at times. But such realinement should be small, and will not disturb reported yields if all materials are weighed with reasonable accuracy.

It is equally important to weigh ingots accurately, if the yield reported is to be regarded without question. If the ingot weight is estimated by the method of adding rolling-mill product, scrap, scale and a fixed heating loss to give ingot weight, it will introduce an error which will vary directly with the accuracy of the empirical determination of heating losses, and the exactness of the weights for product, scale and scrap.

By the same token, estimates of mill scrap charged to open-hearth departments are prone to inflate the gross metallic mixture and to result in an ingot yield lower than actually obtains. All such estimates are sources of possible error, making the check of yields at open-hearth departments difficult and of questionable value. For these reasons, the following method of determining basic open-hearth yields assumes reasonable care in the weighing of all materials entering the furnace, and that all the scrap and ingots are similarly accounted for. The discussion is based largely on American basic open-hearth practice.

Losses in Basic Open-Hearth Practice

Basic open-hearth losses are usually as follows: carbon eliminated with waste gases; metalloid eliminations in slag; free Fe in slag; unrecoverable spillage; metallics lost and lodged in checker chamber dust, brickwork, and slag pockets, and carried away by waste gases; and wastage incidental to recovery and preparation of miscellaneous scrap. If the condemned ingots and ingot butts are added to this group and provision made for loss on "additions," this grand total, subtracted from the gross metallic mixture, gives the ingot yield.

To facilitate the following method of calculating yields, these are grouped as metalloid losses; iron lost in slag; spillage; oxidation and losses due to foreign materials; and miscellaneous losses. Spillage refers to losses involved in handling hot metal, small irrecoverable splashings and shot, often swept up with debris around the furnace and thus lost. Losses due to foreign materials are the dirt, oxides, paint, oil, moisture and other foreign materials adhering to scrap, and accounting for some difference between actual metallic weight of scrap and its normally accepted weight. When pig iron is used from sand-cast beds, this element must also be considered.

The miscellaneous losses are made up of free Fe in slag; iron in slag pocket accumulations and checker chamber dust, waste gases, etc.; unrecoverable spillage on pit side; and losses due to extraneous SiO_2 due to erosion of furnace structure. With the relative amounts of these various losses determined, a yield calculation can be made for any charge or type of steel which will check actual good practice with satisfactory accuracy.

In addition to these losses, certain scrap is produced, making it necessary to establish a standard for good practice for these elements, which can be based on the experience of plants considered representative in this respect. One must also consider the loss of chemically combined iron in the slag. Fig. 1 is a flow chart of the metallic charge and the components of the output. A simple method of yield calculation is proposed, as follows:

*United States Steel Corporation, New York. This is abstract of a paper delivered Feb. 18, before the Iron and Steel Division of the American Institute of Mining and Metallurgical Engineers, at the annual meeting in the Engineering Societies Building, New York.

TABLE I—AVERAGE SLAG ANALYSES

	Run-Off Slag, 25 Per Cent	Tapping Slag, 75 Per Cent	Composite Slag, 100 Per Cent
SiO_2, per cent	20.94	16.20	17.39
P_2O_5, per cent	2.25	1.85	1.95
CaO, per cent	18.90	43.99	37.73
MgO, per cent	6.93	8.26	7.93
Fe, per cent	21.96	12.64	14.97
Mn, per cent	14.48	8.14	9.73
$Al_2O_3+TiO_2$, per cent	3.24	2.71	2.85
S, per cent	0.12	0.17	0.16

An average analysis of final slag should be available. Where plants operate with run-off slags, the approximate proportion of run-off should be known, which, combined with final slag, is readily calculated to composite slag. All slags contain SiO_2 and Fe, the latter the calculated amount from iron oxides in the slag. Free iron in the form of shot in slag is not considered, since this would be shown under miscellaneous losses. The ratio of Fe to SiO_2 in the slag, or for convenience Si (equivalent), affords one a method of measuring the amount of iron loss in slag.

It is obvious that all silicon, as metalloids are eliminated, will find its way as SiO_2 in slag, that the SiO_2 content of fluxes, ores, dolomite, and some of the furnace erosion eventually appear in slag, and added to this such dirt as may accompany the charge. Therefore, knowing the amounts of SiO_2 or Si of all materials, and the amounts contributed by each, and the Fe and SiO_2 or Si content of the slag, the total Fe loss in slag can readily be calculated.

The following example deals with a composite of run-off and tap slags. The same treatment obtains for plants with final slags only. In a slag (composite) showing 17.39 per cent SiO_2 and 14.97 per cent Fe (chemically combined), the ratio of Fe to Si is 1.85. In other words, every part of the charge introducing 1 lb. Si carries with it 1.85 lb. Fe into slag. This necessarily requires a fairly accurate check for SiO_2 or Si, since if the total known SiO_2 or Si does not check with the amount shown in the slag, it will result in a lower iron loss than actually obtains.

To indicate clearly the application of this method of calculating yields, an example is furnished. It is necessary to have a minimum of data for fairly exact calculation, viz.: Analysis of iron, metalloids in scrap, Fe and SiO_2 content of ore, SiO_2 content of dolomite, limestone and spar, residual in bath, average analysis of run-off and tap, or tap slag only if the former does not obtain, and the proportions of gross metallic mixture components and fluxes used in the charge.

For convenience the analysis of materials is arranged as follows: The data upon which the illustrative calculations are based are derived from operation of a basic open-hearth plant which produces low and medium-carbon steels (0.10 C to 0.50 per cent C) and pertains to a year's production. The average slag analyses are in Table I, being in the ratio of 25 per cent run-off and 75 per cent tap slag.

Table II gives the analyses of the different charge components. It should be noted that in this table silica is converted to a silicon equivalent, i. e., SiO_2 converted to Si is calculated from the atomic weights as follows: $Si(28) + O_2(32) = 60$ and the ratio of Si to SiO_2 is 28/60 or 46.67 per cent. The Fe to Si ratio in slags is derived from the composite slag.

Table III shows the losses by groups of the charge components and, as will be seen from Table IV, the total loss in each of the six groups shown in Table III, multiplied by the percentage of each component charged, gives the loss per ton of total metallic charge.

It will be noted that the components are arranged to show the Si equivalent of materials carrying SiO_2 into the slag. The losses of the various parts of the charge can be conveniently arranged in groups showing metalloid losses, iron loss in slag (Fe to Si ratio), spillage, etc., and miscellaneous losses. One then arrives at the total loss involved in each part of the charge.

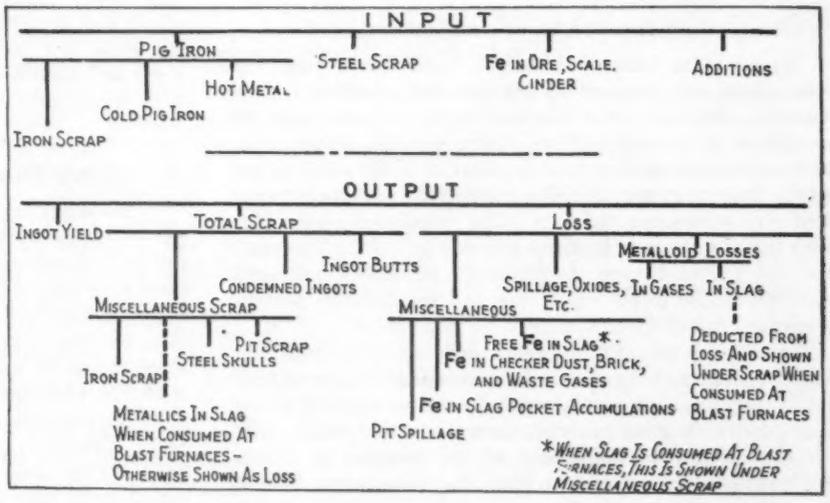


Fig. 1. Flow Sheet Showing Input and Output Metallic Charge in Basic Open-Hearth Furnace

TABLE II—ANALYSIS OF MATERIALS USED

	Per Cent					
	SiO_2	Fe	Si	C	Mn	P
Pig iron	...	...	1.12	4.28	1.60	0.200
Steel scrap	...	...	...	0.18	0.45	0.015
Ore (natural)	6.69	54.1	3.12	...	...	....
Limestone	0.85	...	0.39	...	...	....
Dolomite	1.69	...	0.79	...	...	....
Fluor spar	4.90	...	2.28	...	...	....
Slag (composite)	17.39	14.97	8.11	...	...	....
Residual in bath	...	...	...	0.12	0.16	0.015

Slag ratio, Fe to Si, 1.85.

The metalloid losses are the difference between those contained in the pig iron and scrap and the residual in the bath. The iron loss is merely the product of the Si shown for each component times the Fe to Si ratio in the slag, which in this instance is 1.85. In the case of ore, since this is shown on the natural basis in Table II, and must be converted to iron base for Table IV, the calculation is as follows: $\frac{3.12}{0.541} \times 1.85 = 10.67$.

These total losses do not mean that each metallic constituent actually loses by weight such percentages. But by such an arrangement an easy method is possible in determining losses. Having obtained the total losses on each component in the charge, it is necessary only to multiply such by the percentage of these materials in respect to total metallic charge. It should be stated, and will be later amplified, that the loss on additions represents the loss obtained on the pure alloys, since the iron content for convenience is normally shown under pig iron. The results obtained are presented in Table IV.

It will be noted that the total losses on the metallic charge are 7.10 per cent (Table IV), while dolomite, limestone and spar, because of their SiO_2 content, contribute

TABLE III—LOSSES IN COMPONENTS OF BASIC OPEN-HEARTH CHARGE

Type Losses	Fe in Ore Scale, Etc.	Hot Metal or Pig Iron	Steel Scrap	Lime-stone	Dolo-mite	Spar
Metalloid losses:						
Carbon, per cent....	...	4.16	0.06	...	...	...
Silicon, per cent.....	...	1.12	...	...	...	...
Manganese, per cent.	...	1.44	0.29	...	...	...
Phosphorus, per cent	...	0.185	...	...	...	...
Iron loss in slag (Fe to Si ratio), per cent.	10.67	2.072	0.09	0.74	1.46	4.24
Spillage, oxides, foreign losses, per cent....	...	0.50	0.40	...	...	...
Miscellaneous losses, per cent.....	0.75	0.75	0.75	...	...	...
Total losses, per cent..	11.42	10.227	1.59	0.74	1.46	4.24

0.105 per cent, or a total of 7.21 per cent. The small loss caused by these fluxes is a direct result of their low SiO_2 content. If the amounts used were larger, and particularly were the SiO_2 contents higher, these losses can become appreciable. For convenience in calculation, all the dolomite or the SiO_2 thereof is assumed to enter slag. Since the error might be 10 to 20 per cent, the total possible error is 0.005 per cent, or negligible.

Credits for Blast Furnace Use

Where blast furnaces consume open-hearth slag, the total losses are reduced by the amounts used and their metallic contents. This recovery in some cases may be as high as 3 per cent or more on the metallic charge, and, while no difference is shown on yields, a credit is made for scrap, thereby increasing the proportion of scrap recovered and decreasing the loss. The calculated yield after allowing for the actual scrap recovered is 87.99 per cent. For the period of one year this plant showed an ingot yield of 88 per cent, which can be considered a perfect check.

Total scrap was 4.8 per cent, made up of 3.8 per cent miscellaneous and the remainder condemned ingots and ingot butts. Could it be shown that such a recovery is not consistent with good practice, then the actual yield of 88 per cent is low to the extent of the decrease in scrap. For example, let us assume that the total scrap should have been 4 per cent, then the calculated yield would be approximately 0.80 per cent higher than that actually obtained, or 88.79 per cent. Since the difference lies in scrap produced, one can investigate the source of the high scrap production.

(To be concluded)

TABLE IV—CALCULATION OF BASIC OPEN-HEARTH YIELDS

Materials	Material Used, Proportion of Metallic Charge, Per Cent	Losses in Charge Components, Per Cent	Loss Based on Total Metallic Charge, Per Cent
Fe in ore, scale, etc	5.4	11.42	0.617
Hot metal	56.3	10.227	5.758
Steel scrap	37.8	1.59	0.601
Additions	0.5	25.00	0.125
Total metallic charge.	100.0	....	7.101
Limestone	6.9	0.74	0.051
Dolomite	2.7	1.46	0.039
Fluorspar	0.35	4.24	0.015
Total losses			7.206
Less metallics recovered in slag			(a)
Net losses			7.21
Scrap recovered:			
Miscellaneous scrap			3.80
Condemned ingots and ingot butts			1.00
Metallics in slag			(b)
Total scrap			4.80
Total net loss and scrap			12.01
Ingot yield			87.99
Total			100.00

(a) and (b) compensate for each other.

Hydraulic Press for Bending Thick Boiler Plate

To form a steel plate 2¼ in. thick, 40 ft. long and 10 ft. 7 in. wide into a boiler shell requires massive special machinery. *Engineering*, Dec. 7, 1928, describes the plant for this purpose built by Babcock & Wilcox, Renfrew, England. The plate is bent in a hydraulic press, or rather a series of six presses placed close together acting as one. The vertical arms are far enough apart to clear the widest plate, and the six ram units act through a continuous roller 40 ft. long, comprising the upper forming tool. The anvil also contains plate pinching rollers, adjustable sideways. All the cross-heads are lifted and lowered simultaneously by geared nuts on the main vertical arms, driven from a single shaft. Bending pressure may be exerted at four different pressures, the maximum totaling 8000 tons. Caster beds are concealed in niches below the anvil, and attached to segmented gearing, so they follow the plate as it is bent by successive pinches. Such equipment will bend to three-quarters of a circle, from 3 to 4 ft. 6 in. diameter.

Alloy Steel in Locomotive Building

Two large locomotives recently put into operation by the Canadian Pacific Railway have been designed with the use of a considerable amount of alloy steel for the purpose of reducing weight. The steel bed castings are cast integral with the bumper beams. The cylinders are separate, but are of cast steel. The combined assembly of cast steel cylinders and locomotive bed castings has effected a saving of between 4000 and 5000 lb.

Wheel centers and miscellaneous steel castings, such as pump brackets, guide yokes, piston-head centers, crosshead bodies, link support brackets, etc., are all of cast nickel steel. The use of alloy steel for these parts has permitted a reduction in sections which previously were ⅞ to 1 in. in thickness to ½ and ⅝ in., without sacrifice of strength.

Main and side rods and crankpins are of a low-carbon nickel steel of a new specification. It is believed by *Railway Age* that there is more alloy steel used in the production of these locomotives than has heretofore been used in any locomotives. These engines weigh 423,000 lb. without tender and have a maximum tractive force of 60,800 lb.

Ferrophosphorus Made by Double Smelting

The Cumberland furnace owned by the Warner Iron Co., Nashville, Tenn., situated near Dickson, Tenn., has been operated on ferrophosphorus since the beginning of the year, making experimental campaigns on a process patented by Joseph Warner. Production of a commercial product is in two stages, the first of which results in a ferro containing 12 to 16 per cent phosphorus. This material forms the ore for the second operation; it is resmelted with additional phosphate rock and flux. It is reported that the end result is an alloy containing 20 to 22 per cent phosphorus, that the furnace runs smoothly and produces a fluid easy running slag, and operates at about twice the rate as when producing an 18 per cent ferrophosphorus in a single stage.

Grinding Tungsten Carbide Tools

Precautions Which Must Be Taken, Owing to the Extreme Hardness of the New Type of Tool Material

BY A. H. PREY*

MUCH has been written describing tungsten carbide alloy, the new tool material; its extreme hardness, the amazing speed at which it will remove metal, the radical change in machine design necessary to utilize it at its greatest efficiency and its probable effect upon the industry as a whole. Much has been written pertaining to it and to results obtained from it. But little, if anything, has been written concerning one phase of its use which is important to the user—the problem of grinding it. And it is indeed a problem.

It is the purpose of this article to discuss briefly only the off-hand grinding problems confronting the user of tungsten carbide tools and to offer suggestions and to make recommendations based upon the experience of a manufacturer of grinding wheels. Extreme hardness is the chief characteristic of tungsten carbide. Various Brinell figures show hardnesses from 1800 to 2400, compared with a maximum of about 800 for hardened high-speed steel when determined in the same manner (Rockwell no-load converted to Brinell figures). The new material will scratch sapphire and its hardness lies between that of Aloxite (fused alumina) and Carborundum (silicon carbide). It is apparent then that an aluminous abrasive wheel is out of the question for use on this material, and we must go to the harder abrasive, silicon carbide.

Two Forms Supplied to Purchasers

Tungsten carbide material for tools is supplied to the trade in two forms. One is a finished tool ready for use; the other, a roughly shaped piece to be mounted and ground to its final form by the customer. Therefore, from the user's standpoint, there are two grinding problems involved where he mounts his own tool, and there is only one where he buys the finished tool.

In the first case the tool must be ground to its final form and finish ground to secure the proper sharp edge, and a relatively large amount of stock must be removed. After forming there remains only the problem of regrinding, which will be described later. A soft wheel, grades *P* to *V* (Carborundum Co. grading), and grits 40 to 60 in *W* bond is recommended for this work.

It must be kept in mind that shop conditions vary widely from one plant to another and this variation will have a marked effect upon the selection of a proper grinding wheel. The regrinding of a tungsten carbide tool should, we believe, consist of three operations—

1. Rough grind
2. Finish grind
3. Stoning or honing.

The rough grind is to bring the tool to its proper shape and the finish grind and stoning are to give a smooth finish and a sharp edge. The makers of this material emphasize the importance, to its most efficient use, of an edge free from grinding marks. We believe that the combination of a finish grind on a fine grit wheel, followed by a hand stoning operation with a small carborundum stone, will give the proper cutting edge. When the point of the tool is not badly worn, it may be possible to eliminate operation No. 1; but where considerable stock is to be removed it should be carried out. For these operations the following gradings of carborundum products are recommended:

1. Rough grind—60 grit, *N* to *U* grades, *W*-bond wheel.
2. Finish grind—100 to 120 grit, *S* to *V* grade, *W*-bond wheel.
3. Stoning—any fine grit, medium grade carborundum stone; for example—4 x 1 x ½—2F-G6.

In addition to the selection of proper grinding wheels for a good cutting edge, several points in grinding should be watched. Wheel speeds should be low rather than high. From 4000 to 5000 surface feet a minute is about the correct range. The pressure of the tool against the grinding wheel should be light, otherwise excessive wheel wear will result, with no faster cutting action. The customer must expect a higher wheel wear than when grinding high-speed steel.

In the efficient use of the tools made from these new metals, the clearance and tool angles differ from those standard for high-speed steel and the manufacturer's specifications should be followed closely.

A rigid machine is essential, otherwise wheel wear will be excessive. The tool should be on a solid rest; if applied only by hand, without a rest, bumping takes place and the wheel, which is very soft, will quickly get out of true. The tool should be approached to the wheel carefully and the heel should come in contact first, otherwise the tool will dress the wheel, or, at best, a very ragged and chipped-edged tool will result.

Either Plenty of Water or None

There seems to be disagreement among manufacturers of tungsten carbide relating to the use of water in grinding. It is enough here to say that if water is used the supply should be plentiful, as a little is worse than none. The heat conductivity of this material is low and there is danger of localized heating and checking.

There is some indication at present that different gradings will be necessary for use on materials of different makes, but this will have to be determined by additional test work in the field. As the use of this new tool material is yet in the experimental stage, the grinding problems are not yet completely solved. A material having such radical characteristics, compared with those of high-speed steel, must take time to be developed to its utmost efficiency, and grinding wheels must develop along with it.

We have dealt only with off-hand grinding. Machine grinding of this material on any of the several tool grinders is distinctly another problem, still more or less in the experimental stage. It is being given close study and the results will be made available in the near future.

*Engineer, Carborundum Co., Niagara Falls, N. Y.

New Facts About Manganese Steel

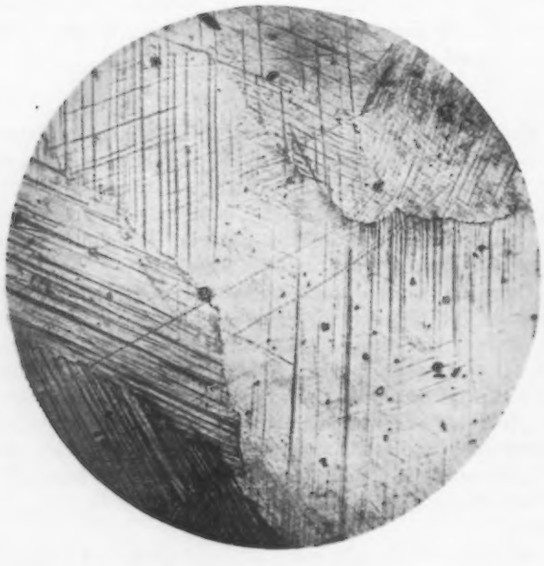
Howe Lecturer Proves That Deformation Lines Contain Martensite—Discovers Heat Treatment for Grain Refinement—New Structure Found in Austenite

IN responding to the invitation to deliver the Howe memorial lecture, John Howe Hall of Taylor Wharton Iron & Steel Co., High Bridge, N. J., chose to follow a subject which was actively in Professor Howe's mind during the closing years of his life, viz., "What is the nature of the deformation lines in the crystals of manganese steel?" As shown in Fig. 1, these apparently follow the cleavage lines of the austenite crystals, and so well serve to show the grain size that a specimen is often intentionally hammered before polishing. It is well known that 12 per cent manganese steel hardens greatly when severely cold worked. It also becomes slightly magnetic. Howe concluded that the markings represent slip along the octahedral cleavages of the austenitic crystals, and that some of the steel immediately adjacent to the planes of slip has been transformed to martensite. In his words, "the unheated etching bands which deformation causes are shown by the accompanying hardening to represent in part martensitization with the formation of beta iron caused by slip, though as their uniform width suggests, they may represent twinning also along the slip planes."

To attack the problem, Mr. Hall had the advantage of the collaboration of F. F. Lucas of Bell Telephone laboratories. High magnification photographs made by the latter solve some of the doubts which existed several years ago. For instance, in Fig. 2 the slip lines appear more like narrow bands of some constituent that etches differently from the ground mass; they are of variable width and not quite parallel. This disposes of the hypothesis that they may represent mechanical twins. When such a sample is tested for scratch hardness, the smooth austenite crystals are grooved deeply, and the striated areas scratched hardly at all; thus the hardness caused by cold working is undoubtedly associated with the markings. Repolishing and etching a cold worked specimen in sodium picrate develops the markings in a manner to suggest that they contain carbide particles; potassium bi-tartrate etching also indicates the presence of ferrite (alpha iron). Since martensite is generally considered to be a fine mixture of iron carbide and alpha iron, the microscopic evidence is that cold work produces martensite along the slip planes.

Further confirmation is had in specific gravity measurements. When austenite transforms it expands; the specific gravity of 12 per cent manganese steel before working is 7.9305; after working it is 7.9226. X-ray spectrograms made by E. C. Bain of United States Steel Corporation Research Laboratory show only the gamma iron pattern for quenched manganese steel, but the alpha iron pattern is superimposed after cold working.

Castings of the general composition carbon 1.25 per cent, silicon 0.6 per cent, and manganese 12.3 per cent, consist of austenitic crystals containing many carbide particles within their mass and around their boundaries. Sodium picrate etch shows a strongly developed dendritic structure, more or less independent of the austenite boundaries. Reheating to various temperatures up to 1060 deg. C. followed by quenching shows that the carbide particles are progressively absorbed by the austenite, but the primary dendritic structure does not disappear. Mr. Hall says this persists even after careful and long continued heat treatment—especially when the metal was "poured hot"—and believes it to be due to an uneven distribution



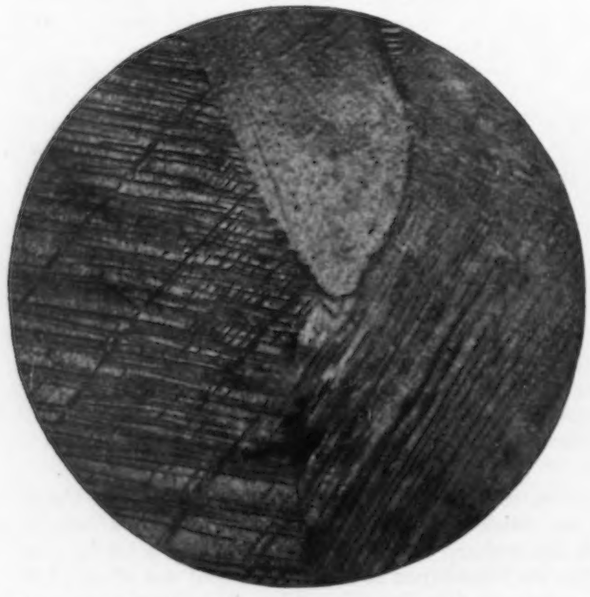
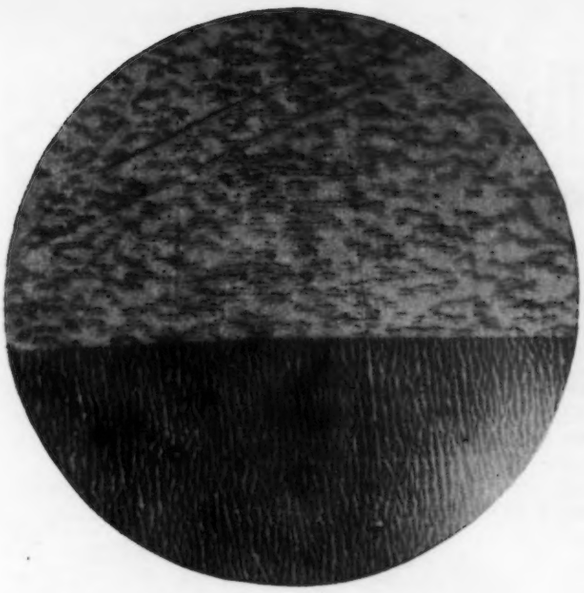


Fig. 1 (at Left) Deformation Lines in Columnar Crystals in Manganese Steel Rail Cast Hot. Etched with nitric acid in alcohol. Magnification 60 dia.

Fig. 2 (at Right) Deformation Lines. Etched with aqua regia. Magnification 1600 dia.



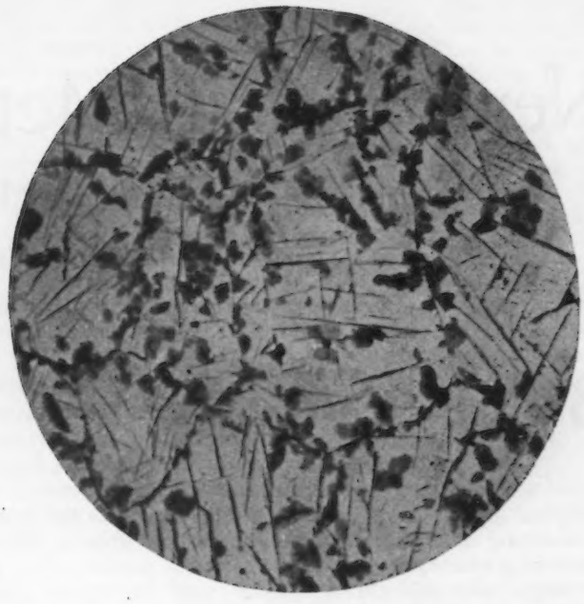


Fig. 3 (at Left) Pearlitic Threads. Steel contains 1.2 per cent carbon, 0.7 per cent silicon and 13.0 per cent manganese, heated to 1060 deg. C. and quenched in water. Etched in nitric acid. Magnification 1750 dia.
Fig. 4 (at Right) Transformations After Heat Treatment. Rolled manganese steel bar, water quenched from 1060 deg. C., heated 25 hr. at 500 deg. C., cooled in air. Brinell hardness 415. Etched in sodium picrate. Magnification 270 dia.

of carbon, originally concentrated in the fillings of the dendrites when the steel solidified, and never completely diffused to exact uniformity. These remnants have very little influence upon the physical properties of well made steel.

Fig. 3 shows a new structure discovered by Mr. Lucas in a casting annealed to absorb carbides, quenched, and etched in nitric acid. Since boiling picric acid does not develop the zebra markings, they do not consist of carbides. They appear most prominently in specimens containing free carbide, but persist in others which have been specially treated to put all carbide into solution. Tentatively they are called "pearlitic threads," and may possibly be the paths of carbon migration.

Another peculiarity of high manganese steel was discussed by Mr. Hall, namely, that a long anneal at 500 deg. C. will convert a soft, non-magnetic metal into a brittle material with greatly increased hardness, having 60 per cent of the specific magnetism of pure iron. Fig. 4, and other microphotographs, show that this heat treatment has caused the austenite to separate out needles and veins of carbide as well as patches of troostite. Higher magnifications show pearlite forming in the troostitic patches. Well marked alpha iron lines also appear in the X-ray spectrogram. If such a specimen is reheated to 750 deg. C. (above the transformation of carbon steel) the carbide in the troostite patches spheroidizes and the alpha iron is reabsorbed into the surrounding austenite.

This work disproves the opinions once current that austenitic manganese steel cannot be changed into the other well known transformation products by any process of heat treatment. It also follows that a change in the austenitic grain size could be induced by a long anneal (to cause transformation) and a reheating (to cause granulation). This was proved by studies of test bars, cast in twins. Comparative figures are:

	Heat Treatment*	Grain Count	Average of Several Tests: Tensile Strength	Average of Several Tests: Elongation in 2 In.
A, cast cold.....	I	22	125,000	45.0
A, cast cold.....	II	46	141,000	55.0
B, cast very hot...	I	9	107,000	42.0
B, cast very hot...	II	48	133,000	51.0

*Heat treatments: I—Heated to 1060 deg. C. and quenched in water. II—Annealed 48 hr. at 500 deg. C., cooled in air, then quenched in water from 1060 deg. C.

Heat of Formation of Cementite Determined by Japanese

PREPARING cementite by electrolyzing a 2 per cent carbon steel and measuring its heat of combustion with a Berthelot-Mahler bomb calorimeter is announced as having been accomplished by the Takeo Watasé, a Japanese investigator, according to a statement in the London *Iron and Coal Trades Review*. Further facts regarding the investigation follow:

In order to insure combustion, a tablet, made of cementite and benzoic acid, was burnt in a magnesia dish placed in a bomb filled with oxygen of 30 kg. per sq. cm. pressure, the temperature rise of the calorimeter being observed with a Beckmann thermometer. The solid combustion residue was subsequently analyzed, the result showing that it consisted of a mixture of Fe_3O_4 and Fe_2O_3. From the observed amount of heat evolved and the composition of the combustion residue, the heat of the reaction, $Fe_3C+3O_2 = Fe_3O_4+CO_2$ was found to be 366.3 kilocalories, which is considerably less than the result obtained by Ruff, hitherto regarded as the most reliable.

Mr. Watasé has been able to show experimentally that Ruff's procedure was defective in two points—in the incomplete combustion and the silicate formation—and that the value of the latter author was too high.

Using the data obtained for the heat of the above reaction and those found in the literature for that of the formation of Fe_3O_4 and CO_2, the heat of formation of cementite was calculated to be —4.8 kilocalories at 20 deg. C. However, the author at the same time stated that, for the determination of the heat of formation of cementite, such a procedure as had hitherto been generally adopted by previous workers as well as by himself is not a suitable one, because the required value was relatively very small, being given only as the algebraic sum of two great and nearly equal values.

New Facts in Metallurgical Practice

Mining Engineers Learn of Importance of Size of Ore in Furnace Burden—Open-Hearth Yields—New Electrode for Cast Iron

BLAST furnace practice, open-hearth problems, and other topics of interest to steel metallurgists and heat treaters were prominently represented on the technical programs sponsored by the Iron and Steel Division of the American Institute of Mining and Metallurgical Engineers at the 137th general meeting assembled in New York, Feb. 18 to 21. This was the first series of meetings under the direction of the new division, which was organized a year ago. The character of the papers, which brought out much new information, augurs well for future programs. There were five sessions, two on the open-hearth, one on the blast furnace, one on coal and coke, and one on general steel problems.

A feature was the Henry M. Howe Memorial Lecture, delivered this year by John Howe Hall, metallurgical engineer Taylor-Wharton Iron & Steel Co., High Bridge, N. J. The usual medals were publicly conferred upon several metallurgists at the banquet. Presentation of a bust of Herbert Hoover to the institute also signalized the annual meeting.

A varied program of high quality was also carried through by the Institute of Metals Division of the institute at four sessions at which 22 papers were presented. A symposium on corrosion, which took up the morning and afternoon programs of Thursday, Feb. 21, was brought to a climax by the annual lecture delivered this year by Dr. Ulick R. Evans, Cambridge University, Cambridge, England. Our review of the symposium and the lecture appears on other pages.

An account of the chief features of the sessions of the steel division, as well as of general matters of interest, follows.

AT the annual meeting, a bust of Herbert Hoover, a past president of the institute and recipient of the Mining Medal in 1928, and of the Fritz Medal this year, was formally presented to the institute. It is the gift of C. A. Fisher, geologist and petroleum engineer, Denver. In the absence of the donor, the presentation was made by Dr. H. Foster Bain, secretary of the institute. The bust is the work of Mrs. W. D. Fisher-Leys, Yonkers, N. Y.

New Data on Phenomena in the Blast Furnace

NEW theories and information on blast furnace practice in general were brought out at the one session devoted to this subject Wednesday morning, Feb. 20. While the attendance was not large, the interest manifested by the 50 or more blast furnace and open-hearth men present was such that they went away from the meeting with many new ideas. William H. Blauvelt, consulting engineer, New York, was in the chair with Dr. T. T. Read, assistant secretary of the institute, as vice-chairman.

What Goes on Inside a 700-Ton Furnace

IMPORTANT data concerning many of the phenomena and reactions which take place at four different levels in a 700-ton blast furnace were revealed for the first time in a paper by S. P. Kinney and C. C. Furnas, North Central Experiment Station, United States Bureau of Mines, Minneapolis, Minn. The title of the paper, which was not preprinted but was presented from manuscript, is "Gas-Solid Contact In The Shaft of A 700-Ton Blast Furnace." In the absence of the authors it was ably abstracted by T. L. Joseph, supervising engineer of that experiment station. The investigation may be safely characterized as stupendous and only a few of the important points can be mentioned here.

Four Planes Across Stack Investigated

The furnace investigated was No. 4 stack at the South Chicago Works of the Illinois Steel Co. Four different levels were selected at which to conduct various experiments. The first, known as plane No. 1, was 6 ft. below the stock line; the second, or plane No. 2, was 7 ft. below No. 1 plane or 13 ft. from the stock line; the third, or plane No. 3, was 11 ft. 7 in. below plane No. 2, or 24 ft. 7 in. below the stock line; and the fourth, or plane No. 4, was 22 ft. 6 in. below plane No. 3, or practically 47 ft. below the stock line.

By means of slides the results of the determination of the temperature, of the gas velocities, of the percentage of carbon dioxide, of the static pressure in inches of mercury, of the size of particles, and one or two other characteristics were revealed. It was found that the experiments demonstrate that the temperature at the various locations varied with the gas velocity, whereas the amount of carbon dioxide was in reverse proportion to these velocities. At plane No. 1 the gas velocity at the center was as high as 400 ft. per second, whereas along the side wall it was 80 ft. per second. One conclusion was that the flow of gases, with reference to the solid contact, was by no means uniform, and it was evident that uniform gas flow with better contact, particularly when size of particles is uniform, insures a larger output with less coke.

As presented the paper is only a small part of a large report of this extensive investigation which will be published a little later in full by the Government.

Better Reduction in Other Stacks

In the discussion it was brought out that at plane No. 3 in this furnace, or 24 ft. 7 in. from the stock line, only 4.6 per cent of the ore had been reduced. At two other furnaces,

one in Alabama and the other the stack of the Columbia Steel Corporation at Provo, Utah, the reduction at approximately the same position was 61.4 per cent in the Alabama furnace and 76.4 per cent in the Utah furnace, comparisons which were regarded as unusually striking. It was pointed out that in the Utah furnace, the practice involves the use of uniformly sized ore and that the experience at this furnace and the one at Alabama, as contrasted at the South Chicago furnace, demonstrate that contact between gas and solid, which involves uniform size of ore charged, is of fundamental importance in the efficiency and economic operation of blast furnaces in general.

Barium as a Substitute for Lime

BARIUM oxide, when suggested as a substitute in a blast furnace for lime, has very little advantage over the lime as a desulphurizing agent. This fact was brought out in a paper entitled "Effect of Barium Oxide on the Desulphurizing Power of Blast Furnace Slags," by C. E. Wood and T. L. Joseph, assistant chemist and supervising engineer respectively, North Central Experiment Station, United States Bureau of Mines, Minneapolis. The paper is a report of experimental work to determine whether barium oxide in any quantity increases the desulphurizing action of blast furnace slag. The investigation was the result of suggestions of S. A. Sanford of the Commercial Chemical Co., Youngstown, who felt that the problem involved a possible saving in fuel if the desulphurizing action of the slag could be substantially increased by the use of the new material.

Barium Oxide Is of Little Benefit

In a summary of the results of investigations, the authors state among other things that the addition of sufficient quantities of barium hydrate to slag of normal composition, so as to introduce up to 5 per cent barium oxide into the slag, does not markedly increase the desulphurizing action of the slag. Also that the desulphurizing action of blast furnace slag varies directly with its "molar basicity." Further conclusions were to the effect that the desulphurizing action of the slag is more closely related to the molar ratio of bases to acids than to basicity based upon percentages of bases and acids present, particularly when a substance of high molecular weight like barium oxide is involved. Surface contact between slag and metal has an important bearing upon desulphurization, the experiments revealed, as shown by the amount of sulphur removed when globules of iron were passed through a layer of slag. Another conclusion was that barium oxide is about one-third as effective as an equal weight of calcium oxide in removing sulphur and in fluxing silica and alumina.

That consideration should be given to the analysis of the metal, as well as of the slag, was suggested by James T. MacKenzie, metallurgist and chief chemist American Cast Iron Pipe Co., Birmingham. He said that it is recognized that manganese is a factor in desulphurization and that silicon and carbon have an effect on the fluidity of the metal. In cupola practice, dolomite has the same effect as lime. The thought was presented by H. T. Morris, metallurgical engineer Bethlehem Steel Co., Bethlehem, Pa., that the heavy character of barium might cause some of the slag to be fixed in the metal. Mr. Joseph said that the investigation had not revealed any and that barium, when substituted for lime, reduces the volume of the slag.

Attacks Fuel Economy of Blast Furnace

CHARACTERIZING his paper as a mild attack on the fuel economy of the blast furnace, Richard Franchot, consulting chemist Washington, presented his paper entitled "The Blast Furnace Theory." Mr. Franchot contends that nitrogen of the blast, as well as oxygen, is chemically active and that this activity can by no means be ignored. Nitrogen is endothermic, whereas oxygen develops heat. The author suggests that, if the key to the secret of fuel economy cannot be found in hearth reduction, how then is the hearth heat consumption to be accounted for?

In an attempt to answer this question, Mr. Franchot suggests that the endothermic chemical activity of the air nitrogen, as evidenced in various ways, gives a basis of fact upon which to account for a substantial part of the hearth heat as developed by the oxygen. The hypothesis that heat development by air combustion in the hearth is restricted by nitrogen fixation, that the availability of the combustion heat for high-temperature work is seriously limited by this action, that consequently the hearth work requires a larger amount of coke than would otherwise be the case, has such a strong basis of fact and affords such a reasonable explanation of the furnace's behavior that the author may perhaps be pardoned for again presenting it. The manifest inadequacy of generally held theories may perhaps give the nitrogen hypothesis an added value.

Briefly stated, the idea is that as the blast heat is increased and the combustion temperature tends to rise, this effect is increasingly offset by increasing nitrogen activity; the difficulty of raising hearth temperature being increased by a resistance associated with the combustion itself. In other words, the effectiveness of the high-blast heats now in common use is in substantial measure curtailed by endothermic formation of nitrogen compounds in the combustion zone.

A Nitrogen Hypothesis

Mr. Franchot concludes his valuable paper by recapitulating certain facts which he believes supports the hypothesis and discusses objections to the nitrogen hypothesis. In conclusion he states that if it happens to be true that air-nitrogen fixation is a weighty factor, limiting smelting efficiency and contributing to a 40 or 50 per cent loss of energy to the furnace, it is predictable that the furnace of the future, through control of this factor, will attain a fuel economy that is entirely beyond the range of the present furnace.

Open-Hearth Problems Reviewed

TWO sessions were devoted to open-hearth furnace problems. The most important one was the round-table discussion on the physical chemistry of steel making on Wednesday afternoon, Feb. 20. At the steel-melting session on Monday morning, Feb. 18, these papers were presented. Some account of the comment on these papers was published in THE IRON AGE, Feb. 21, and one of them, that by C. D. King on "Basic Open-Hearth Yields," will be found elsewhere in this issue.

Physical Chemistry of Open-Hearth Operations

OPENING a crowded meeting devoted to practical questions relating to open-hearth operation, A. L. Feild, of the Union Carbide & Carbon Research Laboratories, Long Island City, N. Y., spoke of the relations between chemistry and physics and the birth of the new science of physical chemistry as a fundamental in present-day open-hearth operation. In outlining the character which the meeting was to take—that of a round-table discussion—he spoke of a set of questions propounded, to elicit comment, by Leo F. Reinartz, American Rolling Mill Co., Middletown, Ohio, who was prevented by illness from being present.

These questions were read either singly or in groups, as circumstances dictated, by C. D. King, of the United States Steel Corporation, New York, and answers were given by Dr. C. H. Herty, Jr., United States Bureau of Mines, Pittsburgh. After Dr. Herty's answer to each question or group of questions the topic was thrown open for general discussion, which was participated in liberally by those present.

Foaming heats were taken up from the point of view of the cause of the foaming and how it could be prevented. The idea was advanced that one cause of foaming may be so rapid an evolution of gases, particularly in carbon elimination, that the slag is unable to pass the gas through at

Ulick R. Evans, Prominent British Scientist, Was Institute of Metals Lecturer

such a high rate. Surface tension of the slag and its viscosity were stated to be factors in this matter.

Elimination of sulphur and phosphorus in the presence of high-manganese pig iron was discussed by several speakers. R. W. H. Atcherson, blast furnace superintendent Illinois Steel Co., Gary, Ind., reported no difference in sulphur elimination between high-manganese iron used in regular basic practice and low-manganese iron used for duplexing.

A good drop in sulphur was reported, however, by W. E. Buck, metallurgist Granite City Steel Co., Granite City, Ill., particularly when the blast furnace iron is high in sulphur, and especially if the ladle of metal stands for some time before being poured into the open-hearth furnace. Sometimes as much as 0.015 per cent drop will be registered under this condition. In his plant a Treadwell closed ladle is used, bringing the iron about 1.2 miles from the blast furnace. He attributed the elimination of sulphur under these conditions to a drop in its solubility in iron as the temperature is reduced.

In this connection Dr. Herty pointed out that elimination of sulphur in the mixer is a function of temperature. If the mixer is carried at a low temperature, a good deal of the sulphur is worked out. If it is kept hot, not much effect is noted.

Open-Hearth Slags

Bringing up the question as to the form in which iron oxide exists in open-hearth slags, Dr. Herty advanced the opinion that FeO is in solution in the slag. On the other hand, Fe_2O_3 usually is combined with CaO or exists as magnetite. This question was developed further by Prof. William J. McCaughey, Ohio State University, who discussed slags mainly from the point of view of silicates.

Reduction of the content of iron oxide in the slags was related by Dr. Herty to definite knowledge of the sources from which the oxide enters the slags and the extent to which those sources could be controlled. He gave five separate methods of adding oxides, including rust on the scrap in the charge, oxidation of the scrap during melting and before it is covered by the slag, ore additions in the furnace, decomposition of limestone and oxidation of the slag itself.

In the normal working of a furnace, these oxides of iron are taken out of the slag mainly by the elimination of metalloids from the iron. Consequently, the oxide content of the slag is determined by the relation between the total amount put in and the total amount taken out. It is determined also in a measure by the rate at which it is put in and the rate at which it is taken out.

High-silicon slags are of large volume. Consequently, in such a case, the iron oxide is low from the mere effect of dilution.

Reduction of iron oxide in open-hearth slags may be made drastically by two methods. The slag may be taken out of the furnace and thrown away and a new slag made in which the initial oxides will be absent; a large amount of slag may be made, resulting (by dilution) in a low percentage of iron oxide. Neither of these methods is recommended. The percentage may be cut down, however, by watching each entering element, such as those listed in a previous paragraph, and taking care that the flame is not too oxidizing. At this point, however, a warning was issued, because an oxidizing flame is needed if the furnace is to make any speed.

Officers for 1929

President: F. W. Bradley, San Francisco, Cal., president Bunker Hill & Sullivan Mining & Concentrating Co., and also president of the Alaska Juneau Gold Mining Co., as well as of several other gold and silver mining companies.

Vice-Presidents: Edgar Rickard, mining engineer, 42 Broadway, New York, and H. A. Buehler, state geologist, Rolla, Mo.

New Directors: Francis W. Paine, Paine Weber & Co., Boston; Eugene McAuliffe, president Union Pacific Coal Co., Omaha, Neb.; Erle V. Daveler, general manager Butte & Superior Mining Co., Butte, Mont., and W. R. Wright, manager Ford, Bacon & Davis, Inc., Chicago.

Considerable discussion came up over the equilibrium constant of (C) (Fe_2O_3), which in earlier investigations had been assumed by Dr. Herty and others to be of the order of 0.010 to 0.016, and is now found to be considerably smaller. Dr. Herty reported getting as low as 0.0014 in recent work, while Augustus B. Kinzel of the Union Carbide & Carbon Research Laboratories gave a still lower figure at 0.0005, derived by experimental work. Mr. Feild stated that this experiment had been checked several times and the same result obtained each time. On the basis of calculations, however, he has been using 0.0010 for this constant.

Temperature Measurements

Development of a calorimeter method of taking open-hearth temperatures was brought forth by Mr. Kinzel, but its use was discouraged by other speakers, who considered it too cumbersome. J. M. Gaines, Jr., United States Bureau of Mines, Pittsburgh, reported the development of a clay tube which could be put into the furnace and shoved down through the slag, permitting the use of an optical pyrometer sighted through the tube upon the surface of the metal below the slag line. This tube may be maintained in the furnace for as much as 20 min.

Slag action in the ladle of steel from the furnace was brought up by Dr. Herty, with particular reference to investigations which had been made. Two diagrams in a paper prepared by him for this meeting show the changing characteristics of both the slag constituents and the metalloids, during the period from the beginning of tapping a heat into the ladle until 50 min. afterward. These diagrams will be reproduced next week. The discussion reported

John Howe Hall, American Foundry Metallurgist, Delivered the Howe Memorial Lecture

above parallels much of what the paper contains.

Abstracts of two of the papers presented at the steel-melting session follow:

Gases Extracted from Iron-carbon Alloys by Vacuum Melting

CONTINUATION of the work on gas analysis, described before the Institute of Metals Division a year ago, was covered in a paper by N. A. Ziegler of the research laboratory, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., read before the American Institute of Mining and Metallurgical Engineers at the February meeting in New York.

American Engineers and Metallurgists Who Are 1929 Medalists

JOHN HAYS HAMMOND

P. D. MERICA

E. C. BAIN

W. E. GRIFFITHS

While the earlier paper was largely descriptive in character, dealing with the various parts of the apparatus and method of operations, the present one gives numerical data obtained as a result of a series of experiments with iron-carbon alloys. Apparatus and methods applied are essentially the same as before.

In the present work we are dealing with gaseous mixtures obtained as a result of vacuum melting of various ferrous alloys. When the terms "degasified sample" and "products of degasification" are used, they refer to the sample remaining after the vacuum fusion of the alloy, and the gaseous products removed therefrom, respectively.

The writer does not wish to imply that the metallic products of this process are absolutely free from any gaseous elements, nor that the gases obtained are present as such in the original sample. These two points are not yet definitely known and are subjects for future investigation.

But the point which has been established beyond doubt is that all the gases dealt with come from the metallic charge, and are present either in the charge as such, or are produced as a result of chemical reactions going on within the charge. The suggestion that the gases are due to the reactions between the metallic charge and the refractory materials has no valid basis.

General Procedure

A series of iron-carbon alloys was prepared in a magnesia-lined graphite crucible placed in a high-frequency laboratory furnace open to the atmosphere. The materials used were Westinghouse electrolytic iron and Acheson graphite. Each alloy, after it was completely molten, was kept in the liquid state for 10 min., cast into a small iron mold, and cooled in air to room temperature. In this way a series of castings, weighing about 1 kg. each and ranging in carbon content from 0.0038 to 4.45 per cent, was obtained.

Each of these alloys was remelted in a bell jar vacuum furnace, the gases given off being collected and analyzed in the way described in the previous paper. High-refractory porcelain crucibles were used for remelting the alloys, and the "refractory correction" was applied in each case in the ordinary way.

[Details of the alloys and what was found in connection with each are discussed in the paper and illustrated by diagrams.]

Summary

1. A series of laboratory iron-carbon alloys, ranging from 0.0038 to 4.45 per cent carbon, as well as some commercial steels and cast irons, have been investigated for gas evolution by vacuum melting.

2. Water vapor is given off by low-carbon laboratory alloys and by steels, but not by high-carbon alloys and cast irons. The amount is very small.

3. Carbon dioxide is evolved in relatively small quantities in all samples.

4. Carbon monoxide is the principal constituent of the gaseous mixtures in all cases. The amount increases rapidly with the increase of carbon in the original sample.

5. Free oxygen is given off by all samples, but in negligible quantities.

6. Hydrogen is not evolved by the laboratory samples and by the cast iron, but is to a small extent by open-hearth steel.

7. A certain iron-carbon alloy (about 0.07 per cent carbon for this particular series) contains just enough carbon and oxygen to be very nearly decarburized and deoxidized by the vacuum melting, as judged from the results of the chemical analysis, and the metallographic examination.

8. Commercial alloys have the same characteristics, as far as gas evolution is concerned, as the laboratory samples of the same carbon content.

9. The number of inclusions decreases uniformly with the increase of the carbon content.

Unreduced Oxides in Pig Iron and Their Elimination

FREQUENT reference has been made to a certain type of iron known generally as "bad iron," "dirty iron," etc., both by steel makers and producers of iron castings.* Open-hearth operators have claimed that such iron was entirely within the specified limits as to ordinary analysis, but it was difficult to make good steel from it.

It has been suggested that unreduced material in the iron is responsible, also that most trouble is experienced with the iron when the blast furnace is delivering a product whose analysis is more or less variable. Other reasons suggested are the use of scrap or borings, unsintered flue dust in the burden, a cold hearth, too high a proportion of unsuitable grade of ore, or the form of the carbon in the iron.

Inasmuch as a "spell" of dirty iron

*From a paper read by C. H. Herty, Jr., and J. M. Gaines, Jr., respectively, physical chemist, and assistant physical chemist, Pittsburgh Experiment Station, United States Bureau of Mines, before the February meeting of the American Institute of Mining and Metallurgical Engineers, at New York.

occurs without warning and may be of short duration, it was deemed advisable to attempt to simulate the conditions existing before and during such a period, and to compare the quality of the steel made with the normal and with the dirty iron. The Bourne-Fuller Co., Cleveland, which has a single furnace that supplies metal direct to the open-hearth shop, offered to cooperate in such a test.

Three heats were observed using iron made under normal operating conditions at the blast furnace. The burden was then increased to throw the blast furnace on the cold side and two open-hearth heats were made from the resultant low-silicon, cold-hearth iron. The operation of the blast furnace and open-hearth was followed closely, a large number of samples, temperature readings and other data being taken. The open-hearth product, a low-carbon rimming steel, was rolled into 4 by 4-in. billets, then to 1½-in. rounds; some of the billets were rolled into sheets and were zinc-coated.

All of the samples were analyzed for the usual constituents, as well as for non-metallic inclusions, and billet samples from each heat were analyzed for iron oxide.

Summary of Results

Blast Furnace.—It can be stated from the results that there is generally a certain quantity of oxides, chiefly SiO_2, FeO, MnO and Al_2O_3, in pig iron from the blast furnace. The total amount varied in this test from a trace to about 0.13 per cent of the weight of the iron. It can be shown that the highest percentages of silicates (this term will be used to indicate the total non-metallic impurity, since SiO_2 is the main constituent) are met at times when the furnace is working irregularly. A comparatively rapid change in hearth temperature, whether hotter or colder, or an increase in the rate of stock descent, such as a slip, will cause a sharp increase in the silicate content of the iron.

Open-Hearth.—The iron used during the five heats varied in its silicon content from 1.11 to 0.20 per cent. As would be expected, the heats with the low-silicon iron melted soft and offered some difficulty in working and in shaping the slag. However, no noticeable difference in the quality of the finished steel could be detected. Bars from the heats were rolled into sheet and were zinc-coated, with no difference in quality between heats. It should be kept in mind that low-carbon rimming steel heats were made in this investigation, to avoid complications arising from the introduction of silicon in higher carbon heats.

[The authors went at length into details of the tests and what was found. Tables and curves showing logs of the various heats appear in the paper.]

Effect of Silicates on Finished Steel

In none of the test heats was the steel sufficiently dirty to show defects which could be traced to silicates from the pig iron. Inspection of the extracted silicates from the steel samples shows a number of particles identical in appearance with those found in the pig iron persisting all through the heat and into the finished product.

It is definitely known that silicate inclusions rich in SiO_2 tend to cause red-shortness if present above certain limiting concentrations. This limit varies with the type of rolling or forging operation which the steel undergoes. Relatively smaller amounts of silicate may cause surface defects.

Conclusions

Data collected during this test are not sufficient to correlate bad iron with trouble in the finished steel. However, there are four points which indicate strongly that certain results recorded may be the main factors in the bad iron situation:

1. The open-hearth operator is of the opinion that any trouble which may be blamed on the pig iron usually comes at a time when the blast furnace is operating irregularly.

2. It is a matter of general opinion and some experimental fact that silicates in the finished steel will cause various kinds of trouble.

3. It is an experimentally determined fact that the higher the silicates in the iron the higher the silicates in the steel.

4. This test shows that the silicates in the iron are higher when the blast furnace is operating irregularly than when it is running steadily.

From these four points the conclusion may be drawn that, if the blast-furnace operation is irregular, trouble is liable to be encountered in the finished steel. Just how irregular the operation must be before such trouble is encountered will probably vary for each blast furnace and for the different grades of steel made.

New Electrode and Other Topics

TWO papers contributing valuable information on transformations, allotropic and otherwise, in pure iron, another paper on nitrogen and the hardening of metals, and a fourth on a new electrode for welding cast iron, made up the program for the general session of the Iron and Steel Division, Monday afternoon, Feb. 18. Dr. George B. Waterhouse, professor of metallurgy, Massachusetts Institute of Technology, Cambridge, Mass., was chairman, and A. B. Kinzel, Union Carbide and Carbon Research Laboratories, Long Island City, N. Y., was vice-chairman.

Nitrogen in the Hardening of Iron

IN line with some of the recent theories of the cause of hardening in metals, the contribution by R. S. Dean, R. O. Day and J. L. Gregg, metallurgical engineers Western Electric Co., Inc., Chicago, contributed some interesting information. The paper was entitled "Relation of Nitrogen to Blue Heat Phenomena in Iron and Dispersion Hardening in the System Iron-Nitrogen." The paper was presented in abstract by Mr. Dean.

It has been generally observed, said the authors, that iron, as an outstanding exception among metals, increases its hardness and strength by low temperature annealing after cold work, and also by increase of testing temperature to the range of 150 to 300 deg. C. The investigation was made by the authors with the object of ascertaining if similar phenomena were observed in high purity iron, and, if not, to the presence of what impurities these phenomena could be traced. Three kinds of iron were taken for a study of hardening by reheating after cold work:

1. Vacuum-melted electrolytic iron; melted in an Arsem furnace in a magnesia crucible. That this iron was of high purity is indicated by a magnetic permeability above 20,000.

2. Electrolytic iron melted in air in a small laboratory furnace.

3. Armco iron, a commercial material.

These materials, in the form of forged bars, annealed at 980 deg. C. in vacuum were reduced 30 per cent in thickness by cold rolling and then heated to temperatures varying from 100 to 500 deg. C. The Rockwell hardness number was measured after each treatment. The authors state that it was at once apparent that the vacuum-melted electrolytic iron showed no hardness while the air-melted iron increased markedly in hardness by reheating to 250 deg. C. The Armco iron was intermediate between the two.

Hardness Due to Nitrides

Photomicrographs of these three products were studied and it was significant to note that in the electrolytic iron, melted in the laboratory in air, there was a very considerable amount of impurity which had been taken up, apparently nitride. Another photomicrograph showed that by reheating to 500 deg. C. and cooling in air, these nitride-like needles disappeared. Chemical analyses for nitrogen resulted in the conclusion that the presence of nitrogen is the cause of the hardening.

The authors also studied the question as to whether hardening by reheating after cold work was a solution phenomena, and the results seem to support the idea that it is. Answering the question as to whether the increase of strength with increase of temperature, or the so-called temper brittleness, is absent in pure iron, the authors state that temper brittleness is absent, or very slight, in nitrogen-free iron and that it is due, apparently, to the solution of nitride in the heating and pulling

process. Commercial irons, say the authors, owe their property of hardening by reheating after cold work, as well as their increase in tensile strength in the range of 100 to 300 deg. C., to the solution of iron nitride present. The system iron-nitrogen is accordingly a room-temperature hardening system and, without cold work, very little increases of solubility is evidenced below 350 deg. C. But after that temperature is reached there appears to be a sharp increase to 500 deg. C. At 300 to 350 deg. C. sufficient agglomeration of the nitride might take place so that the particles might be seen under the microscope.

Dispersion and Not Solution Hardness

Some exception to the authors' conclusion was taken by A. B. Kinzel who contended that the hardening is not due to solution but to dispersion. If it were due to solution, a softer material would result, whereas the opposite would be the case if due to dispersion. He complimented the authors on their fine work.

Cast Iron Welded from a Wrought Iron Rod

PRODUCING excellent cast iron welds with a new type of electrode, the core of which is wrought iron, was described in a paper entitled "Metallic Electrodes for Cast Iron Arc Welding," by Shun-Ichi Satoh, research staff, Mitsubishi Research Laboratory, Tokio, Japan. It was presented briefly by Doctor Waterhouse. The wrought iron electrodes are wound first with asbestos twine and then coated with mixtures of graphite and carborundum. The mixtures were first reduced to a paste by adding to them a solution of water-glass (1:3). They were next put in a glass tube, 9 mm. inner diameter, with a funnel-shaped mouth. By passing the bars through the tube they became coated with the mixture. It was found that the best mixtures were three in kind; one containing 60 and 40, another 50 and 50, and the third 40 and 60 per cent graphite and carborundum respectively. Photomicrographs of the iron resulting from using these electrodes are given in the paper, as well as chemical analyses of the deposits. A typical analysis among several showed the welded part to contain total carbon, 3.073; graphite carbon, 0.973; combined carbon, 2.100; silicon, 1.289; manganese, trace; phosphorus, trace and sulphur, 0.037 per cent. A more extended abstract of this paper will be presented in a later issue of THE IRON AGE.

The author states that he has been able to obtain a series of cast irons from gray to white without using cast iron electrodes but by coating wrought iron bars with the mixtures described. In this work he found curious phenomenon with the use of barium carbonate.

Not the First Electrode of This Type

That a similar electrode was patented in this country in March, 1915, and issued in 1917 was claimed by P. A. E. Armstrong who offered comments. Mr. Armstrong said that he believed that the action of the barium carbonate flux electrode can be thoroughly appreciated if the results obtained from a similar type of electrode be considered. For example, if an iron electrode were fitted into a tube of carbon and the metal core were connected to the negative side of the power and the arc struck between the end of this electrode and the work, the power would flow over the metallic core and through the carbon sleeve so that the arc would really be between the work and the two current paths of the electrode, one of course being the metal core and the other the carbon sleeve.

This comment was brought out by the fact that the author stated that in order to see what effect could be obtained by adding some substances to the coating to one of the electrodes, the following test was made: The electrode was connected to the positive pole of the generator and three coatings were used, containing respectively 3 per cent, 5 per cent and 10 per cent, each of calcined borax, calcium carbonate and barium carbonate. No good results were obtained.

Transformation of Pure Iron

IT is not possible here to adequately abstract the two excellent papers on transformations on pure iron which were part of the program for this session. One paper was entitled "Pure Iron and Allotropic Transformations," by T. B. Yensen, research laboratory Westinghouse Electric Mfg. Co., Pittsburgh, and the other, "The Gamma-Alpha Transformation in Pure Iron," by Albert Sauveur, professor of metallurgy, Harvard University, Cambridge, Mass., and C. H. Chou, National Tube Co., Lorain, Ohio.

The paper by Mr. Yensen brings out some valuable new information on this important topic and represents a large amount of research work. Doctor Sauveur's contribution also adds much information to this highly technical and somewhat controversial subject.

Determining Value of Coals for Making Coke

EVALUATION of coal for making blast furnace coke was the general subject of a joint session of the Iron and Steel Division with that of coal and coal products, Wednesday afternoon, Feb. 20. Two papers were

Legion of Honor—Members for the Last 50 or More Years

Truman H. Aldrich, '78, mining engineer, Birmingham, Ala.

W. S. Ayres, '73, consulting mining engineer, Hazleton, Pa.

Andrew A. Blair, '75, chemist, Booth, Garrett & Blair, Philadelphia.

Walter M. Brodie, '72, mining and metallurgical engineer, Washington.

H. M. Chance, '74, mining engineer, Philadelphia.

Frederick G. Corning, '77, consulting mining engineer, New York.

H. S. Drinker, *Founder* (*Honorary*) Merion Station, Pa.

E. F. Eurich, '74, (*Life Member*), metallurgical engineer, New York.

William E. C. Eustis, '76, mining and smelting, Boston.

Charles W. Goodale, '76, Engineers Club, Boston.

A. Hecksher, '79, 50 East Forty-second Street, New York.

Henry D. Hibbard, '79, consulting engineer, Plainfield, N. J.

Julian Kennedy, '79, consulting engineer, Pittsburgh.

William St. George Kent, '72, 860 Riverside Drive, New York.

Frank Lyman, '77, president Low Moor Iron Co. of Va., New York.

John Markle, '79, retired, 2 Rector Street, New York.

Samuel Mather, '79, merchant, Cleveland.

Walter McDermott, '74, mining engineer, 78 Coleman Street, London, England.

Philip N. Moore, '74, consulting mining engineer, St. Louis.

Henry S. Munroe, '72, consulting engineer, Litchfield, Conn.

James Wilson Neill, '79, mining and metallurgical engineer, Pasadena, Cal.

E. E. Olcott, '74, consulting mining engineer and president Hudson River Day Line, New York.

I. P. Pardee, '73, mining engineer and president Hazleton Iron Works, Hazleton, Pa.

Edward C. Potter, '79, 2745 Brandywine Street, Washington.

Alexandre Pourcel, '77, (*Honorary*), Ingenieur Civil des Mines, Paris, France.

William H. Radford, '76, mining engineer, San Francisco, Cal.

Robert H. Richards, '75, (*Honorary*), professor emeritus, Massachusetts Institute of Technology, Jamaica Plain, Mass.

Albert F. Schneider, '74, consulting metallurgical and mining engineer, Engineers Club, New York.

Porter W. Shimer, '79, chemist and metallurgist and president Shimer Chemical Co., Easton, Pa.

John Stevenson, Jr., '76, retired, 109 North Irvine Avenue, Sharon, Pa.

Arthur Thacher, '75, mining engineer, St. Louis.

Edward H. Williams, '76, Westerdale, Woodstock, Vt.

Thomas D. Wood, '79, 1900 South Rittenhouse Square, Philadelphia.

presented at this session and the discussion was quite animated.

Testing Coal for Agglutination

MEASURING the agglutinating power of coal by means of a new test was the subject of one of the papers. The exact title was "A Test for Measuring the Agglutinating Power of Coal," by S. M. Marshall, consulting engineer, Perin and Marshall, New York, and B. M. Bird, supervising engineer, Southern Experiment Station, United States Bureau of Mines, Tuscaloosa, Ala. At the time of the investigation, Mr. Bird was supervising engineeer of the North West Experiment Station of the Bureau at Seattle, Wash. The paper was not preprinted but was presented in abstract by A. C. Fieldner, chief engineer, Experiment Stations Division, Bureau of Mines, Washington.

A description is given by the authors of a method for measuring the coking quality of coals by determining the strength with which a coal will bind together a mass of inert material. The method is a modification of the Campredon and other tests of similar character. Results are shown of the tests of several coals used for making blast furnace coke and for a number of coals from the State of Washington. In some cases the agglutinating index has been correlated with the coke shatter tests. In addition to the agglutinating values, data are given of the coke and by-product yields from distillation and the relation between the ultimate coal analyses, the distillation gas analyses and the agglutinating values. The influence of oxygen in the coal on the gas analysis and the agglutinating value are indicated.

Commenting on the paper after presenting it, Mr. Fieldner said that agglutinating was his own suggestion and that the work was to be carried still further, even on good coking coals. He said that he was not certain that this was the best kind of a test. H. J. Rhodes, Koppers Co., said that the author's test was really a measure of the gluing value of the coal and not really a test of the coking properties. He testified to his interest in the method but said that the test was conducted under quite different conditions from those existing when coking quality is desired and only the coal itself is used because of the presence of inert materials. Most coking coals, he said, have poor coking materials in them but not to the extent of 10 to 1.

Washability of Coals

That the highest economic purity of washed coal can be determined from washability studies of the raw coal, costs of mining and washing coal, and data on the effect of ash and sulphur on the value of the coal for the particular use for which it is intended, are the objects aimed at by the author in writing his paper entitled "Coal Washability Tests as a Guide to the Economic Limit of Coal Washing," by G. S. Scott, chief chemist, American Rheolaveur Corporation, Wilkes-Barre, Pa.

An animated discussion of this paper was participated in by William H. Blauvelt, A. C. Fieldner, James B. Morrow, research engineer Pittsburgh Coal Co., and George W. Evans, consulting coal mining engineer, Seattle, Wash., who recounted some unusual work in washing coals at very low temperatures which he had supervised in British Columbia in recent years.

Medals for 1929 Presented at Banquet

AT the banquet the chief feature was the announcement of the 1929 awards of medals and prizes.

Fritz Medal to Herbert Hoover

The John Fritz Medal, awarded each year by a joint board of the mining engineers, the civil engineers, the mechanical engineers and the electrical engineers, is usually presented at the banquet of the society to which the recipient belongs. The public engagements of Herbert Hoover, medalist for 1929, made it necessary to postpone the ceremony until a later occasion.

Mining Medal to John Hays Hammond

To John Hays Hammond, there was bestowed the Mining Medal established in 1927 by Dr. William L. Saunders, past president of the institute. It is given annually with no restrictions for achievements in mining. It was bestowed on Mr. Hammond "for his notable work as an engineer and developer of mines at home and abroad, his industrial leadership and his public services." This is the third award of this medal, the first having been given to David W. Brunton in 1927, and to Hon. Herbert Hoover in 1928.

Douglas Medal to Paul D. Merica

To Dr. Paul D. Merica, director of research, International Nickel Co., New York, the James Douglas Medal was given. This was established by anonymous donors in 1922 to commemorate the life work of Dr. James Douglas, distinguished engineer and metallurgist, and twice president of the institute. It is awarded once a year for distinguished achievement in non-ferrous metallurgy and without limitation as to nationality or to society membership. Doctor Merica's work is well known to American and foreign metallurgists and his list of scientific papers is a long and honorable one. The medal was given to him for "his contributions to and constructive research in physical metallurgy, especially for his work an aluminum and nickel alloys." The six previous medalists, from 1923 to 1928, inclusive, have been: Frederick Laist, Charles W. Merrill, William H. Bassett, John Michael Callow, Zay Jeffries and Selwyn G. Blaylock.

Hunt Medal to E. C. Bain

To Edgar C. Bain the Robert W. Hunt Medal was given. This medal was established by the partners and employees of Robert W. Hunt & Co., Chicago, in commemoration of the life and work of the distinguished metallurgist and engineer who established the firm and who served the institute as manager, director and president. Mr. Bain has had a wide experience in metallurgical research, particularly as one of the pioneers in the use of X-ray crystal analysis. In the latter work he was recently active as a member of the research staff of the Union Carbide & Carbon Research Laboratories, Long Island City, N. Y. He is now chief of one of the divisions of the research staff of the United States Steel Corporation. The award of this medal is made by the institute's board of directors on the advice of the committee of the Iron and Steel Division of the institute for the best original paper on iron and steel.

The paper which won for Mr. Bain the award this year is by himself and William E. Griffiths and is entitled "An Introduction to the Iron-Chromium-Nickel Alloys," published in volume 75 of the *Transactions*. The

Three Generations as Institute Members

Iron Masters:

Samuel M. Felton, deceased.
Richard F. Peters, deceased.
Richard Peters, Jr., Felton Place, Chester, Pa.

Copper:

Dr. James Douglas, deceased.
James S. Douglas, miner and banker, Douglas, Ariz.
James Douglas, assistant, experimental flotative plant, Southern Rhodesia Base Metals, Rhodesia, South Africa.
Lewis W. Douglas, Congressman from Arizona—Washington.

Smelting:

Anton Eilers, deceased.
Karl Eilers, metallurgist, 233 Broadway, New York.
Karl Fritz Eilers, mining engineer, 233 Broadway, New York.

Blast Furnace:

J. E. Johnson, deceased.
J. E. Johnson, Jr., deceased.
Joseph Johnson, student.

work, which is the basis of this paper, was done by the authors when they were both associated with the Union Carbide & Carbon Research Laboratories. Previous Hunt medalists have been: Robert W. Hunt in 1920, Charles L. Kinney, Jr., in 1926, and John A. Mathews in 1928. Doctor Merica was absent because of illness, and the medal was accepted for him by Sidney Rolle, chairman New York section of the institute.

Hunt Prize to W. E. Griffiths

To William E. Griffiths, metallurgical engineer Duraloy Co., Pittsburgh, was awarded the Hunt prize provided for by the same endowment as for the Hunt medal and awarded to a member not over 40 years of age for a paper or papers on iron and steel. It was given but once before: In 1928 to Dr. Charles H. Herty, Jr., supervising metallurgist United States Bureau of Mines, Pittsburgh.

A Legion of Honor

George Otis Smith, director United States Geological Survey, Washington, retiring president, delivered an address on "Engineering Standards for Society," and the new president, Frederick W. Bradley, responded appropriately to his introduction into the office.

A "Legion of Honor" was established this year to comprise all living members who have been members continuously for 50 years or more, or from 1871 to 1879. There are 33 of these and the roster is found on another page. Five of these were represented at the head table at the banquet.

Another innovation was the announcement at the banquet of a list of families, three generations of which, at present represented by the third generation, have been members of the institute. There are four such groups representing the copper industry, the smelting industry, blast furnaces, and those active in the iron industry.

Iron and Steel Division Reorganized—New Officers

At the election of officers of the Iron and Steel Division the following were selected:

Chairman (one year):

Dr. George B. Waterhouse, professor of metallurgy Massachusetts Institute of Technology, Cambridge, Mass.

Vice-Chairmen (one year):

A. L. Feild, Union Carbide & Carbon Research Laboratories, Long Island City, N. Y.

Bradley Stoughton, professor of metallurgy Lehigh University, Bethlehem, Pa.

Dr. Richard Moldenke, consulting metallurgist, Watchung, N. J.

Executive Committee (three years):

Dr. John A. Mathews, vice-president Crucible Steel Co. of America, New York.

Dr. Albert Sauveur, professor of metallurgy Harvard University, Cambridge, Mass.

Dr. Zay Jeffries, research director Aluminum Co. of America, Cleveland.

(Two years):

Dr. F. C. Langenberg, vice-president Climax Molybdenum Co., New York.

W. J. Priestly, vice-president Electro Metallurgical Sales Corporation, New York.

F. F. Lucas, metallurgist Bell Telephone Laboratories, New York.

(One year):

H. M. Boylston, professor of metallurgy, Case School of Applied Science, Cleveland.

John Howe Hall, metallurgical engineer, Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

John Johnston, director of research, United States Steel Corporation, New York.

CHAIRMEN of the Divisions: Dr. G. B. Waterhouse (left) is new head of Iron and Steel Division. S. Skowronski (right) was reelected chairman of Institute of Metals Division.

Plans are being perfected for a technical session of the division in the Middle West, possibly in Chicago, some time in September. The rules and regulations of the division provide for the appointment of 15 technical committees by the chairman, in addition to a committee on programs and meetings and a committee on papers and publications. Provision is made for the technical committees to become self-perpetuating after their initial organization. The 15 technical committees will replace the eight subcommittees of the former iron and steel committee. Of the eight former committees, six were retained as committees of the division: On iron ore, on the blast furnace, on mechanical treatment, on metallography, on the open-hearth, and on the physical chemistry of steel making. The subcommittee on the foundry was split into two committees: On the steel foundry and on the iron foundry. The sub-committee on the manufacture of steel was dropped. Entirely new committees are 10 in number and cover: Blast furnace coke, wrought iron, Bessemer process, electric steel, heat treatment, and alloy steels.

Scrap Institute Organizes Three New Chapters

Three new chapters of the Institute of Scrap Iron and Steel, one each in Chicago, Cleveland and Cincinnati, have been organized by Benjamin Schwartz, director general, and about 100 new members have been added.

Frank Parker, Briggs & Turivas, Chicago, was elected president of the Chicago chapter, and W. J. Ross, Hyman-Michaels Co., Chicago, was elected chairman of the executive committee. Other officers elected include Walter Bregman, Price Iron & Steel Co., Chicago, first vice-president; Ben Kaplan, M. S. Kaplan Co., Chicago, second vice-president; Isadore Cohen, Cohen Iron & Metal Co., Milwaukee, third vice-president; E. J. Howell, Erman-Howell Co., Chicago, treasurer; and Harry Rosenthal, Chicago, secretary. Members of the executive committee include Dan R. Cohen, of D. R. & F. A. Cohen, Chicago; Max Patinkin of People's Iron & Metal Co., Chicago; Morton Teller, Teller Iron & Metal Co., Chicago; A. B. Alprin, Omaha, Neb.; S. J. Posen, Ohio Iron & Metal Co., Chicago; H. J. Kennen, Hickman, Williams & Co., St. Louis, and Mark Savesky, J. Savesky's Sons, Marion, Ind.

Morris Speer, Rotter-Speer Co., Cleveland, was elected president of the Cleveland-Detroit chapter, with Jacob Simon, of Simon Iron & Steel Co., Lansing, Mich., as chairman of the executive committee. Other officers include E. A. Schwarzenberg, Cleveland, first vice-president; Norman Franklin, Jackson Iron & Metal Co., Jackson, Mich., second vice-president; Myron Cohen, M. Cohen & Son Co., Cleveland, treasurer; David Holub, Holub Iron & Steel Co., Akron, Ohio, secretary. Members of the executive committee are: George Fisher, United Iron & Metal Co., Canton; C. H. R. MacKenzie, Joseph Schonthal Co., Detroit; Harry Simon, H. Simon Co., Cleveland; Harry Goldman, Riverside Scrap Iron & Metal Co., Detroit; A. Barnett, Barnett Iron & Metal Co., Barberton, Ohio, I. Bialosky, Cleveland Iron & Metal Co., Cleveland.

W. C. Hilb, Hilb & Bauer, was elected chairman of the Cincinnati chapter, and R. W. Kolkmeyer, Walter Wallingford & Co., secretary.

Portable Dynamic Balancing Outfit

Use of Stroboscopic Principle to Explore Vibration in Machines—-Both Static and Dynamic Unbalance Covered

BY PETER DAVEY*

DURING the past few years the general tendency to increase the speed of machinery has led to the development of methods of balancing which have greatly improved freedom from vibration. It is now expected of all high-grade machinery, regardless of size, that it shall operate smoothly at all speeds.

Balancing machines in which rotors are balanced before mounting in their bearings are in general use. There are cases, however, where the balancing machine is not applicable or is only partly applicable, and such cases can be classified under three main headings:

1.—Cases where it is more expedient or quicker to balance the rotor after assembly in its bearings, and running under its own power.

2.—Cases where a balancing machine has been employed, but some vibration still remains in the finished product, due to the speed of rotation being higher than in the balancing machine, or to some such condition as temperature change which is met only under operating conditions.

3.—Cases where troubles have developed after a rotor has been in service for some time, possibly due to the shifting of some part of the rotor.

Fig. 1—Essential Components of the Set and the Case (Which Carries the Batteries as Well as the Parts Shown)

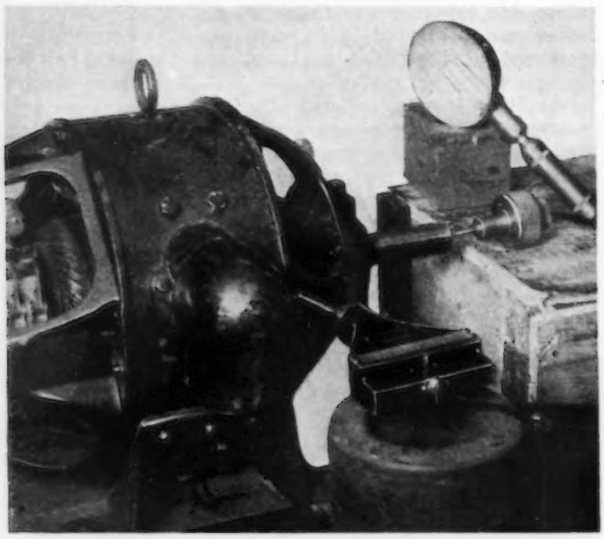


Fig. 2 — Elements Rigged Up to Test the Balance of an Electric Motor at Varying Speeds

Davey Dynamic Balancing Equipment

To meet the cases outlined the Davey dynamic balancing equipment has been developed. It is manufactured under the patents of Vibroscope, Inc., by the Electrocon Corporation, 6 Varick Street, New York. The equipment is easily attached to machines ranging from the largest turbines to units of only fractional horsepower.

It is small and compact, weighing only 29 lb. in its portable case. The stroboscopic principle is utilized in the operation of this equipment.

Briefly described, the stroboscopic principle consists of illuminating rapidly moving objects by a series of instantaneous light flashes, so timed that they are in synchronism with the motion of the moving objects. Thus the moving objects may be made to appear perfectly stationary under the rays of the flashing light.

A rapidly rotating shaft, illuminated by a series of instantaneous light flashes occurring once a revolution, will appear stationary, no matter how fast it is rotating. If the instant at which the flash occurs in each revolution is changed, the shaft will still appear stationary, but in a different position.

This principle can be applied not only to rotary motions, but also to oscillating motions.

In balancing we are interested in two motions, the rotary motion of the shaft and the vibratory motion of the frame of the machine. If we apply the stroboscopic principle to both of these motions we can ascertain the relation between the two, which is the information we require, to correct unbalance.

The equipment consists of three main parts, illustrated in Fig. 1. In the center is the head, the shaft of which is driven by the shaft of the machine to be balanced, either by a special coupling or by a center similar to a tachometer. The function of the head is to regulate the light flashes so that they occur once a revolution.

A phase adjuster is incorporated in the head, so that the light flashes may be made to occur at any desired position in the revolution. This adjuster is graduated in degrees, so that any position of its setting can be definitely identified.

On the left in Fig. 1 is the hand lamp, which embodies a special type of Neon tube, the flashes of which are controlled by the head. When the rotor is illuminated by the head lamp it will appear stationary, no matter how fast it is rotating.

On the right in Fig. 1 is the vibrometer, which, placed in contact with the vibrating machine, indicates not only the amount of vibration, but also the position of the frame in its vibratory path with respect to that of the rotor in its revolution. The whole equipment is shown in Fig. 2, set up ready to balance a motor.

Though the primary object of this article is to describe the application of the equipment, it is necessary to

*Vice-president Vibroscope, Inc., 6 Varick Street, New York.

explain the construction of the vibrometer, in making its application clear.

The vibrations cause a small mirror in the vibrometer to oscillate. Light is thrown on to this oscillating mirror through a narrow slit, and then reflected on to a ground glass scale. The reflected light comes from two superimposed sources, a steady light from an incandescent lamp and a flashing light from a small Neon tube mounted in the vibrometer, the latter being controlled by the head, the same as the Neon tube in the hand lamp.

The light from the incandescent lamp is white and that from the Neon tube is red. The mirror oscillates so that it magnifies the vibration several

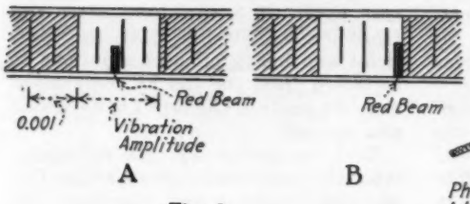


Fig. 3

hundred times, and the ground glass scale is graduated in thousandths of an inch. The strip of white light, since it is oscillating rapidly back and forth, will appear as a continuous band of light, and the width of the band will indicate the amount of vibration.

The red light, however, will appear as a narrow strip, the same width as the slit through which it shines, since it flashes only once during a complete swing of the white light beam. Fig. 3, *a* and *b*, shows two full-size diagrammatic views of the center portion of the ground glass scale. In *a* the red light beam appears halfway between the limits set by the white band.

Now by turning the phase adjuster on the head, as has already been explained, the rotor can be viewed under the rays of the hand lamp at various positions in its revolution.

In exactly the same manner, when the phase adjuster is turned, the red beam can be viewed at various positions within the limits set by the white band. The position of the red beam, therefore, is a stroboscopic view of the position of the vibrating frame, magnified several hundred times.

Fig. 3b shows the red beam on the extreme right, which position it would reach by turning the phase adjuster 90 deg. from its previous setting, when the red beam was in the midway position.

When the red beam travels to the right it indicates that the motion of the vibrating machine is toward the vibrometer, so that if the phase adjuster is turned until the red beam reaches the extreme right-hand position, it means that the light is flashing each time the vibrating machine reaches the end of its swing toward the vibrometer.

Thus we can determine the exact position of the frame of the machine in the path of its vibration, and all we have to do to establish the relation between this and the position of the rotor is to illuminate the rotor with the hand lamp and note its position in the revolution.

Finding the "High Spot"

Previous to commencing the balancing operating, the rotor is marked with a series of chalk numbers, so that any point on its periphery can be definitely identified. Alternatively, a very light disk may be mounted on the shaft, with numbers marked around it. The point on the rotor which corresponds with the extreme deflection of the vibrating machine in

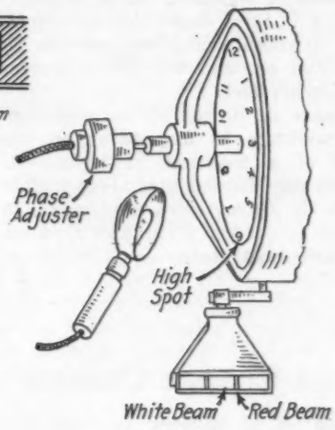


Fig. 4

one direction is referred to as the "high spot."

Reference to Fig. 4 will make clear the method of finding the "high spot." In the case illustrated, when the phase adjuster is set so that the red beam reaches the extreme right, the rays of the flashing lamp reveal the rotor apparently standing still, with No. 6 coinciding with the horizontal centerline adjacent to the vibrometer. This No. 6 is the "high spot." The practical operation of finding the high spot by this method takes but a few seconds, and it is a positive and accurate determination, even when the vibration amplitude is extremely small.

Angle of Lag

It is a well known fact that the "high spot," and the heavy spot which whirls around and causes the vibration, do not exactly correspond. The vibratory motion lags behind the rotary motion, and the amount of this lag increases with the speed. The angle between the high spot and the heavy spot is known as the angle of lag.

At very low speeds the angle of lag is small; at the critical speed, or that speed of rotation which corresponds with the natural period of vibration of the machine as a whole, the angle of lag is 90 deg.; and at very high speeds the angle of lag approaches 180 deg.

When it is practicable to reverse the direction of rotation, the common method of finding the heavy spot is to take a high spot reading in each direction. Then the spot half way between the two high spots will be the heavy spot.

In many cases it is not practicable to run the rotor in both directions, which makes it a difficult matter to estimate the angle of lag by crude methods. In such cases the Davey equipment permits the angle to be rapidly found.

The general characteristic of the angle of lag is shown in Fig. 5, in which the angle is plotted against the speed of rotation, for an average speed case.

From this curve it will be seen that the angle increases very slowly until the critical speed is reached. Then it

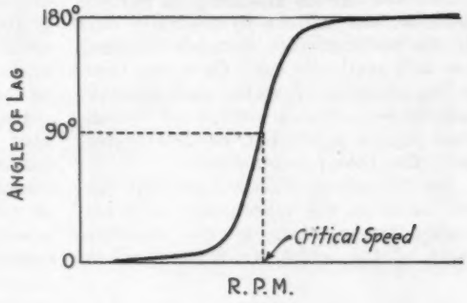


Fig. 5

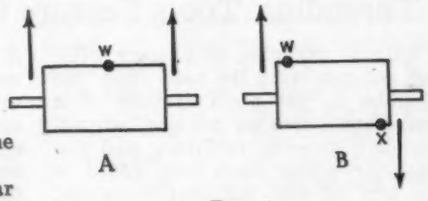


Fig. 6

jumps up suddenly, passing through 90 deg. at the critical speed, and after a further slight increase of speed the curve flattens out again, with the angle of lag nearly approaching 180 deg.

Any method of determining quickly whether the rotor is running at a speed corresponding to the steep or to the gradual slope will be of great value in arriving at the angle of lag. Suppose the phase adjuster is set so that the red beam is on the extreme right, and then the power is shut off so that the machine being balanced slows down.

If the red beam tends to remain near its position at the right end of the white band, during a considerable slowing down of the rotor, it at once shows that the rotor was running at a speed corresponding to the gradual slope of the curve.

If, on the other hand, the red beam starts to travel toward the center of the white band, immediately the rotor begins to slow down, it indicates that the speed corresponds to the steep slope of the curve.

Static and Dynamic Unbalance

A rotor may be subject to unbalance of two distinct characters. The rotor indicated diagrammatically in Fig. 6a is thrown out of balance by weight W, which lies in approximate-

ly the same plane as its center of gravity. This unbalance will cause the rotor to vibrate in a line parallel to its axis of rotation, as indicated by the arrows, and a single weight X equal to W will correct it.

Now suppose the original unbalance W was to one side of the center of gravity, as in Fig. 6b, and suppose an equal and diagonally opposite weight X was added in an effort to correct it. The weight X would obviously correct the static unbalance, but a new condition of dynamic unbalance would be introduced, which would cause the rotor to vibrate about a fulcrum point (the center of gravity), due to W and X pulling in opposite directions, as indicated by the arrows.

A rotor can be statically in perfect balance, but still be dynamically out. It can be in perfect dynamic balance, but still statically out. Or it can have a combination of static and dynamic unbalance. The condition of unbalance which exists can be determined with the Davey equipment.

Set the phase adjuster so that the red beam on the vibrometer scale occupies the position at the extreme right of the white light band, when the vibrometer is in contact with one end of the machine.

Then, without touching the phase adjuster, take the vibrometer to the other end of the machine. If the red beam stays on the right of the white band, a condition of static unbalance exists; if the red beam shifts over to the left of the white band, a dynamic unbalance is indicated; and if the red beam takes up some other position within the white band, it indicates a combined static and dynamic unbalance.

Cases where static or dynamic unbalance exist singly are easily corrected, but engineers with balancing experience know that great difficulty often attends cases where the two conditions exist together. It is frequently found in these cases that an adjustment of weight which corrects the vibration at one end will throw it over to the other end.

Because of its ability to give high spot readings at any point on the frame of a machine, regardless of whether an exposed shaft is available or not, the Davey equipment makes it possible to correct static and dynamic unbalance separately.

Threading Tools Feature Quick Change Chasers

QUICK changing of chasers without removing the tools from the machine is the main feature of a new Namco opening die and two collapsing taps—one revolving and one stationary—that have been added to the line of the National Acme Co., Cleveland. The tools are designed for accurate high-production threading.

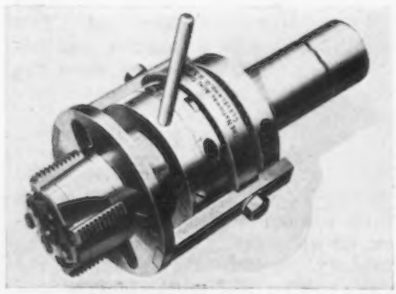
Changing of chasers merely involves the loosening of one screw, the pushing back of the cup or body of the tool and the slipping out of the chasers with the thumb and finger. A fresh set of chasers is then inserted, the cup or body snapped back to the retaining position, the one screw tightened, and threading started again. This operation is quickly accomplished and without disturbing the setting of the threading tools.

Another feature of the new die is the brake shoe arrangement to prevent the chasers from dropping out when they are in the released condition. There are only three major parts of the die, which is hardened and ground throughout. The new opening dies are made in five sizes from 7/16 to 1⅝ in. They are intended to supplement rather than replace the regular line of Namco opening dies, which are recommended where work larger than standard cap screws must be threaded close to a shoulder. However, the opening in the front plate of the new die has been made large enough to permit close-to-shoulder threading on ordinary screws.

The new taps have positive cam action for collapsing the chasers, and, in preventing the chasers from tipping, the cam action serves to eliminate tapered threads. Positive adjustment is effected by two opposed screws which are self-locking. There is full length bearing of chasers on the core piece, the tap being designed so that chasers do not overhang the core piece. The open core piece and front plate allow fine dust, chip particles and heavy oil accumulations to be blown from the tap by compressed air. All parts of the taps are hardened and ground.

Both the stationary type collapsing tap, which is designated as the CS, and the revolving tap, the type CR, are made in six sizes from 2¼ to 4⅝ in.

Inserting the Chasers in the Namco Revolving Type Threading Die



The Stationary Collapsing Tap Is Above and the Revolving Type Tap Below. Both have quick removable chasers

Automobiles and Building Main Supports of Business

Current business activity, although proceeding in some lines at near record rates, still rests on the incomplete basis of automobile production and building construction, which continue to support the relatively high level of operations in iron, steel, copper, rubber tires, oil, machine tools and electrical manufactures.

"This closely related group of industries in turn has been most directly supported by the expansion of credit in recent years, and the continuance of the specialized activity in them, largely depends upon the future trend of credit and financial conditions," according to the monthly statement on business conditions by the Conference of Statisticians in Industry, which operates under the auspices and with the cooperation of the National Industrial Conference Board, New York.

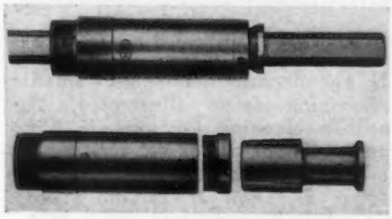
Domestic and international credit conditions are described as "unsettled," although, excepting possibly the building industry, "their influence has not yet become widely reflected in general business."

As of Jan. 1, the Prest-O-Lite Co., Inc., acquired the business of the Acetylene Products Co., which operated two acetylene producing plants located at 401 East Buchanan Street, Phoenix, Ariz., and at 914 Texas Street, El Paso, Tex. These plants are now being operated as units of the Prest-O-Lite chain, which now numbers 38, located at industrial centers throughout the country. Everett R. Kirkland is superintendent of the Phoenix plant, and Carl F. Chesak of the El Paso plant.

Feed Pusher for Screw Machines

POSITIVE grip and release, uniform feed, elimination of rebound and of drag marks, and unusually long life are advantages claimed for a new type of feed pusher for multiple-spindle automatic screw machines, which is being placed on the market by the Eastern Machine Screw Corporation, New Haven, Conn.

The device comprises two principal parts: the master, which fits on the



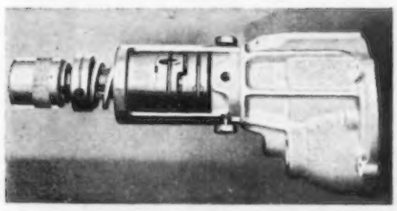
Uniform Feed and Elimination of Rebound Are Advantages of the New Feed Pusher

end of the usual feed tube; and the inner pusher, which is installed inside of the master. The inside of the master is tapered to receive the inner pusher, which grips the stock firmly when the feed tube is pushed forward in feeding. When the feed tube is drawn backward, the inner pusher is in the released position and slides freely over the stock. When a machine is once equipped with a set of masters it is only necessary to change the inner pushers when changing from one size stock to another, the master remaining as a permanent part of the machines.

The uniform feed and the elimination of rebound are emphasized as lessening the amount of scrap from short pieces, thereby reducing cost. These features also permit the stock to be fed at high speed, which results in a saving of time. Elimination of drag marks has been of special advantage when working bright finish bars, such as piston rods.

Nut Driving Attachment for Thor Electric Tools

A "KICK-OUT" nut driving attachment with double slip clutch is being manufactured by the Inde-



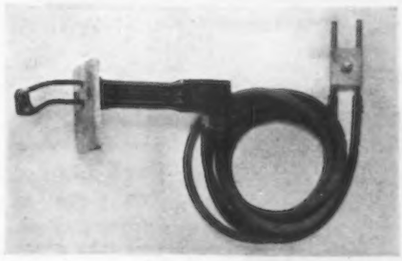
Elimination of Ratcheting and Jerking Is Claimed for the Clutch Arrangement

pendent Pneumatic Tool Co., 600 West Jackson Boulevard, Chicago, for use with both its high-frequency (180 cycle) and universal electric tools. Made in several sizes for driving nuts and bolts from 3/16 to 1½ in. in diameter, the device is claimed to assure proper and uniform tightness of nut, and to eliminate stud breakage and stripping of nuts.

The attachment is inclosed in a sleeve that extends over the clutches and protects all moving parts from dust and grit. It has an auxiliary clutch that operates under spring tension and disengages and lifts itself off on a cam when the nut is driven to a predetermined tension. This permits the front end of the attachment to remain stationary for one revolution before the auxiliary clutch is again engaged, during which interval the operator may pull the machine away from the nut. It is stated that this arrangement, in eliminating ratcheting and jerking, saves the operator from fatiguing jolts. Adjustment for different sizes of nuts and bolts can be made conveniently by the operator of the tool.

Water-Cooled Welding Electrode Holder

A NEW type of water-cooled carbon electrode holder for heavy-duty manual welding by the carbon arc process has been brought out by the Lincoln Electric Co., Cleveland. Although designed primarily to in-



Protected Water-Cooled Holder for Welding Electrodes

sure greater comfort and less fatigue for the welding operator, it is stated that it has been found, after extensive tests, that the new holder effects a marked economy in the use of carbon electrodes.

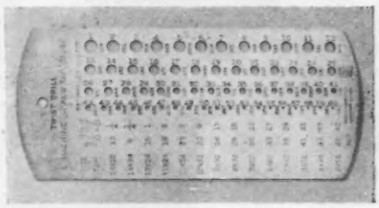
The design of the electrode holder makes it possible to weld with the arc tip of the carbon electrode projecting less than 3 in. from the carbon holder. Consequently there is less carbon area heated, thereby reducing the vaporization of the carbon. Thus, it is pointed out, it is possible to use smaller sized carbons with higher current density, effecting a decided saving in electrode costs. The weight of the holder is only 3¼ lb. and it is said to be well balanced and easy to handle, because of the extreme flexibility of the lead cable.

An unique feature which contributes to the light weight of the holder is the use of the hose which carries the water to carry also the cable to the holder. Each of the two water tubes contains a small, light cable from the connector to the holder. The water flowing through the holder thus acts also as a cooling agent to the cables. By the use of this cooling agent the size of the cable to the holder is reduced to a fraction of the size otherwise necessary.

The carbon holder consists of coiled copper tubing through which water constantly circulates, the carbon electrode being inserted through the coil. The carbon holders are made in sizes for use with ¼-in., 5/16-in., ⅜-in. and ½-in. carbons. A hand shield of compressed magnesium protects the operator's hand from the arc rays. The hand grip of the holder, also, is water-cooled.

Twist Drill and Machine Screw Tap Gage

IN showing at a glance the correct drill to use with any common size of machine screw tap, the twist drill



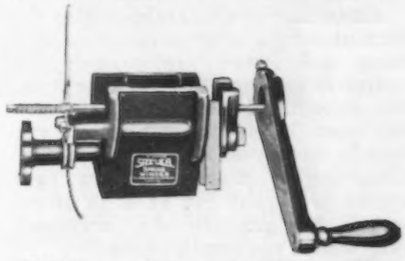
The Gage Shows the Twist Drill for Any Common Size of Machine Screw Tap

and machine screw tap gage illustrated prevents errors and speeds up operations.

On the left side of the gage, which is designated by its maker, the Brown & Sharpe Mfg. Co., Providence, as the No. 707, there is a table giving size of tap, pitch of thread, size of tap drill required and size of drill for making hole through which the outside diameter of tap will pass. Figures beneath each hole on the gage represent the size of drill in thousandths of an inch and the figures, 1 to 60 inclusive, near the hole indicate the number of the drill. The gage is of hardened steel and is tested for accuracy.

Device to Make Coil Springs

A SPRING-WINDING machine, operated by hand, is offered by the Shaler Co., Milwaukee. The device



Tension or Compression Springs Up to 1⅞ in. in Diameter Can Be Made

is simple in design and in operation; it is said that any type of coil spring can be made on it without previous experience or skill.

The process of making the spring consists of inserting the wire and

turning the handle until the desired length is reached. The device will make tension or compression springs from the smallest size up to 1 7/8-in. in diameter, in any size wire from the smallest up to and including 5/32-in.

Compression springs, accurately spaced, with both ends neatly squared, can be duplicated over and over again, because of the positive space adjustment, which is easily regulated up to and including 5/8-in. Five arbors, of the sizes most commonly used, are furnished as standard equipment.

Grinder for Radial Type Airplane Motor Cams

CAMS for radial type airplane motors are generally much larger than those used in the conventional automobile or tractor engine and have contours with several lobes or high points adjacent to which are re-entrant curves of comparatively small radii. Two such cams are usually made integral, separated by a narrow space, and when ready for grinding are not attached to a shaft or other part of the motor.

This machine, shown in the illustration, is equipped with a motor-driven wheel spindle and an attachment for grinding large diameter loose cams. The attachment is driven from a special headstock having an extra speed reduction to obtain the slow speeds of revolution necessary for this type of cam. A pair of test cams in grinding position is shown in the accompanying end view of the machine, the grinding wheel being in contact with a point or lobe of the further cam.

Machine Arranged for Grinding Large Diameter Loose Cams

The End View Shows a Pair of Test Cams in Grinding Position. The wheel is seen below the end of the water pipe

Automobile cams rarely employ re-entrant curves in their contours, and when such curves are required the radius is seldom less than 3 or 4 in. For grinding the contour of automobile cams 18-in. diameter wheels are usually employed, although in a few cases special attachments are furnished to permit use of 6 to 10-in. wheels for grinding the occasional cam with a re-entrant curve.

Radial motor cams however, have re-entrant curves of such small radii that wheels less than 1½ in. in diameter may sometimes be necessary to finish the contour. To meet these requirements the Norton Co., Worcester, has designed a special machine on which very small wheels may be employed.

The grinding of this type of cam is necessarily a much slower operation than the grinding of automobile cams. In the first place the surface to be ground, or length of the contour, is several times greater, which in itself requires a slow revolution. Then the smaller the radius of the re-entrant curves, the slower the revolution in order that the roller may follow the master cam and the grinding wheel have time to cut. Furthermore the very small wheel employed cannot remove the metal as rapidly as a large wheel.

Wear of the grinding wheel is always an important factor in cam grinding, as a small reduction in the size of the wheel will affect the shape of the contour. Then, too, the wheel wears rapidly. For very accurate work the final finish grinding must be accomplished with a new wheel of the same diameter, within close limits, as the roller used in generating the master cams. From the manufacturing standpoint, therefore, it is highly desirable that signer employ as large radii as possible in the re-entrant curves.

Polishing Lathe with Vee-Belt Motor Drive

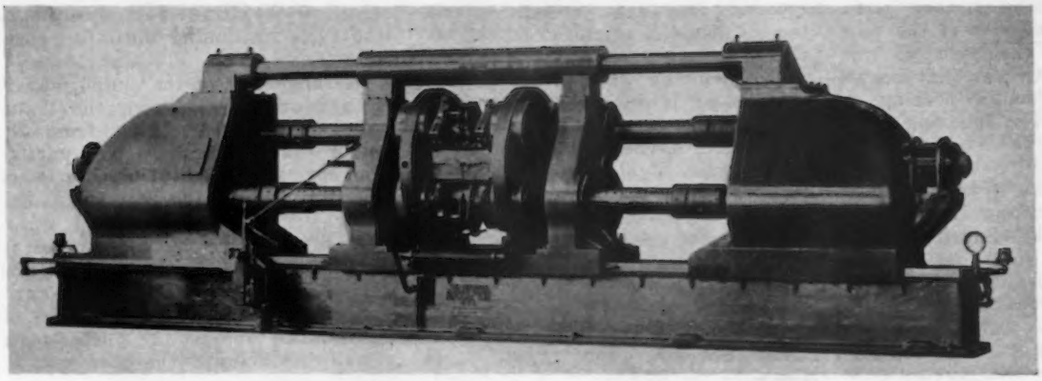
IN announcing the single spindle polishing lathe illustrated, the Gardner Machine Co., Beloit, Wis., emphasizes the use of vee-type multiple belt drive and the means for obtaining a range of spindle speeds with alternating current motor drive.

The machine is rigid and compact. Its spindle is driven by a 5, 7½ or 10-hp. motor through vee-type multiple belts. The motor, of inclosed fan-cooled ball-bearing type, is mounted on a bracket cast integral with the base of the machine as shown. Adjustment for varying belt lengths is provided, and in case of breakage, belts can be replaced quickly without disturbing the spindle bearing mounting. Belts and sheaves are completely inclosed. By using sheaves of proper diameter, any desired spindle speed may be obtained; this is of advantage where alternating current only is available or is preferred.

Changes of Spindle Speed Are Obtainable by Using Sheaves of Different Diameters

Polishing wheels up to 3½ in. thick may be used. A double-row Timken adjustable bearing is used in each end of the spindle, these bearings being mounted in a dust-proof cartridge housing that may be removed from the base without disturbing the bearing mounting on the spindle. The entire spindle assemble can be removed as a unit.

Safety spindle nuts, double-capped oil hole, push-button control station, and convenient spindle-locking device are other features of the machine, which is designated as the No. 3-CB.



Production Is at the Rate of 30 Rear Axle Housing Carriers Per Hour

Axle Housing Carriers Bored and Reamed Rapidly

FOR boring both ends of the rear axle housing carrier on farm tractors and for similar work on other pieces, a special two-way horizontal rough boring, semi-finished boring and reaming machine has been built by the Defiance Machine Works, Defiance, Ohio. Production is at the rate of 30 finished pieces per hour, or one every 2 min.

Each head has three spindles, which are spaced in a 29-in. circle and are driven by helical gears. The heads are inclosed and are splash lubricated. The fixture, which except for the clamps is in one piece, revolves from the center. There are four clamping positions, one station for loading and unloading, one for rough boring, one for semi-finish boring and the fourth for reaming. Each station is equipped on both sides with hardened bushings for guiding the boring bars. Although the fixture, when loaded, is very heavy, it can be indexed with one hand by one man. The spindles, the fixture and the boring bars are mounted in Timken roller bearings.

The boring bars are 7¼ in. in diameter and are inlaid with hardened steel packing strips which are ground true to a fit in the revolving bushings, in the guide housing as well as in the fixture. The height from the ways of the machine to the center of the fixture is 28 in., to the lower spindle 17¾ in., and to the upper spindle 38¼ in. The travel of the heads is 38 in. The speed of the spindles is 32 r.p.m. The machine is equipped with Oilgear feed, which can be regulated to suit the requirements. It is also equipped with an endless belt conveyor under the fixture to carry the borings to one side of the machine.

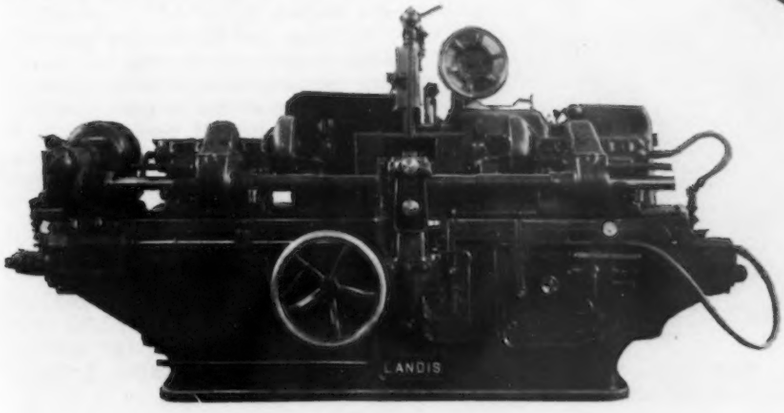
Each head is driven by a 10-hp. 1200-r.p.m. direct connected motor. The Oilgear pump is driven by a 3-hp. motor and the conveyor and its speed reducer by a ¼-hp. motor that takes current from a light socket. The floor space occupied by the machine is 7 ft. 2 in. by 26 ft. 6 in. The height is 90 in., and the net weight of the machine is 5653 lb.

New Hydraulic Crankpin Grinder

THE Landis Tool Co., Waynesboro, Pa., is offering the crankpin grinder, illustrated, which is designated as the type AB because the front portion of the machine is like the front part of the company's type A crank grinder, while the rear portion is similar to that of the type B plain machine. This combination results in a specialized unit by means of which all the pins of a crankshaft may be ground without removing the work from the machine. More rapid production and lower cost are claimed.

Work spindles are driven from a longitudinal shaft so that both fixtures are rotated in unison, the power being supplied by a 2-hp. motor through worm and worm gear. The final drive to each spindle is by silent chain. The work carrying fixtures have hydraulically-operated clamps, the hydraulic pressure being applied through the work spindles and controlled by a valve at the front of the machine. The fixtures cannot be rotated before the shaft is securely clamped. A brake is provided to prevent drifting when rotation of the work is stopped.

All Pins of a Crankshaft May Be Ground Without Removing the Work from the Machine. The main drive is by 25-hp. motor through multiple strand Texrope



The work-rest is attached rigidly to the bed of the machine. The jaws are advanced and withdrawn by hydraulic pressure, but the final adjustment is made by hand-adjusting screws. The arrangement is such that unless the jaws are in their back position, the work carriage cannot be traversed. On most of these machines the rest is arranged in the center to take a mechanical sizing gage.

Endwise locating of the crankshaft is by bringing it against a stud on the

side of the indexing fixture plate, or bringing the shoulder of the rear bearing against the side of the clamping block. An arm that locates from the center main bearing is sometimes used. The indexing plate is incorporated in the work-carrying fixture and locates the shaft radially, either from the holes in the fly-wheel flange or from locating lugs on the cheek of the crank. Spacing is accomplished by a rigid bar having lugs arranged according to the spacing of the pins on the shaft. A positive stop on the underside of the work table comes against the top lug on the bar, thereby placing the corresponding pin of the shaft in front of the grinding wheel. A hydraulic cushioning device at the end of the bar serves to eliminate shock and vibration when the carriage traverse stops.

The diamond holder is held in a bracket that is clamped in the crank-carrying fixtures. When a mechanical wheel dresser is used a similar bracket carries the truing wheel, as well as the diamond for truing the sides of the grinding wheel.

Oil pressure is supplied by a twin-geared ball-bearing oil pump. One set of gears takes care of the hydraulic traversing motor, the other set the work rest, work clamps and hydraulic wheel feed. The company's standard type A paddle-type traversing oil motor is employed on the machine.

The grinding wheel head, of massive design, is equipped with a 36-in. wheel and is carried by a vee and a flat guide having chilled surfaces. The spindle, of alloy steel, is driven from the end, and an extra driving pulley is supplied to permit change of speed to compensate for wheel wear.

The hydraulically-operated wheel feed is controlled by levers located close to the feed handwheel. The speed of the in-feed, after the wheel comes in contact with the work, is regulated by means of a dash-pot. The wheel-head is mounted on a subslide which is moved by means of a piston and cylinder arrangement directly beneath it. Positive stops are provided so that the position of the grinding wheel with relation to the work is always fixed. A screw and long bronze nut beneath the wheel head insure accurate and sensitive hand feeding.

The main drive is by a 25-hp. motor, mounted on the rear of the machine, and an eight-strand Texrope drive. When the machine is arranged for lineshaft drive, an auxiliary drive bracket is mounted on the bed in place of the motor. This type of machine will be available in the 16 x 32 in. and 16 x 42 in. sizes.

Accelerating Clutch Reduces Starting Torque

THE Washburn Shops of the Worcester Polytechnic Institute, Worcester, Mass., have developed the automatic accelerating clutch shown in the line sketch herewith, which, installed between a motor and driven machine, is said to reduce starting torque and thus permit the machine to start with a uniform acceleration. Extended tests of the device are said to show that both the machine and motor are relieved of undue shock and strain.

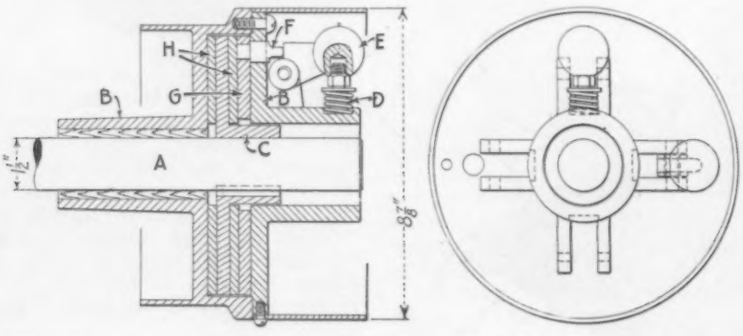
Where the inertia of the machine is very great and the starting torque consequently severe, motors that are 50 per cent oversize are frequently required. It is claimed for the Washburn clutch that motors of load capacity may be installed in the same machines, thereby doing away with peak load conditions at starting. The mechanism is entirely automatic in action, requires no lubrication, and permits use of simple electrical starting apparatus.

The operating principle of the device is similar to that of the ordinary disk clutch, but the action, instead of being hand-operated, is controlled by centrifugal force, which automatically engages with the speed of the machine. The centrifugal cams are on the driven side of the clutch, so that in starting the only load on the motor is a slight spring pressure on the friction disks, a friction which, however, is sufficient to turn over slowly the shaft of the driven machine. As soon as this shaft begins to rotate, centrifugal action of the clutch cam takes place, increasing the pressure on the disk in accelerating progression and increasing the speed of the driven part accordingly, the cycle continuing until full speed is attained.

Arrangement of the clutch may be seen in the illustration, the transmission of power being from the motor shaft *A* to the driven part *C*. The spring *D*, set at a predetermined pressure against the centrifugal ball *E*, which is part of the bell crank, acts to give the initial impulse in starting. The centrifugal action forces the cam face of the bell crank against the pin *F*, the shoulders of which press against the pusher-plate *G* and thus actuates the fiber disks *H*. Sufficient friction is set up to impart motion from the motor shaft through the disk *C* to the driven part. This sets up increasing centrifugal action to the four clutch balls, which in turn increases frictional contact of the disks, the cycle continuing until driving shaft and driven part are rotating at equal speed.

The principle involved permits of wide range of adaptation. The cam weights may be designed to apply sufficient force to make the clutch practically a solid coupling at full speed, or they may be of a weight that will entirely disconnect the clutch at any desired percentage of overload and permit the motor to run free. With the motor accelerating to speed in less than 3 sec., the machine acceleration may be fixed at from 15 to 45 sec.

Other designs of this clutch permit the use of chain between motor and machine, or the clutch arranged as an integral part of driving pulley or pinion on the motor shaft.



The Clutch Permits the Machine to Start With Uniform Acceleration. It is entirely automatic, and requires no lubrication

New Departure to Spend Millions for Expansion

The New Departure Mfg. Co., division of General Motors Corporation, has work under way or contemplated which will require the expenditure of several million dollars. Its plants at Bristol, Meriden and Elmwood, Conn., will be expanded. An addition, 106x 220 ft., four stories, will be built at the Meriden plant and will add 80,000 sq. ft. of floor space to that division. A large building is now being erected at the Bristol plant. At Elmwood extensive improvements are to be made in present buildings. The Bristol building is to be 128x404 ft., five stories.

A large list of machine tools and other shop equipment will be required and inquiries will probably be issued soon. A small list of tools of special design has already been ordered. F. G. Hughes is vice-president in charge of production; C. B. Simmons is production superintendent, and T. C. D. Crow is chief engineer.

The Gray Iron Institute, Cleveland, has recently added 16 foundries to its membership, according to an announcement of its manager, Arthur J. Tuscany.

New Ore Bridges for Zenith Furnace

Two Units, Each Controllable from Two Different Positions—Interlocking Protection

BY W. C. RAUBE*

TWO Industrial-Brownhoist, 550-volt, direct-current ore bridges, with motors, brakes and control furnished by the General Electric Co., were put into operation during June, 1928, at the Zenith Furnace Co. plant, Duluth, Minn. The illustration gives a general view of the bridges and the dock on which they operate.

Two New Ore Bridges Protected Against Skewing by Interlocking Control

The two bridges use a total of about 30 motors, mostly of the new mill type, which meets A. I. and S. E. E. standards. The bridge, apron-hoist and boom-hoist motions have solenoid brakes. The principal motions, consisting of trolley drive, bridge drive and holding and closing lines on the bucket hoist, use magnetic control with bent-frame contactors and definite-time accelerating relays. The other motions are controlled through manual controllers or standard starters.

Holding and closing lines on the bucket hoist use a standard scheme of control for ore bridges, providing power in the hoisting direction and dynamic braking on all points lowering, with an additional provision for power kick-off on the last point lowering for rapidly accelerating revolving parts. The trolley motion employs reversing magnetic control, arranged to give power and dynamic braking points, forward and reverse.

Each bridge contains four motors arranged in two sets of two motors each. These motors may be controlled from either of two operators' stands, one on the bridge structure and the other in the trolley cab.

A complete interlocking scheme is provided to give protection against skewing and to insure operation from only one set of masters at one time. Although there are two bridge master switches in each bridge operators' stand, one for the two motors on the front end of the bridge and the other for the two motors at the other end, the number of trolley conductors between the trolley and bridge structure has been reduced to a minimum. To do this, considerable control interlocking was required.

These two bridges were put into regular operation, unloading boats, immediately after power was turned on. Very little adjustment was required to place the equipment in first-class operating condition.

*Industrial Engineering Department, General Electric Co., Schenectady, N. Y.

New Line of Gasoline Locomotive Cranes

LOCOMOTIVE cranes, especially designed for gasoline engine, Diesel engine or electric motor drive, are now being manufactured by the Link-Belt Co., Chicago. These will be known as the L type cranes and will be furnished in five sizes.

The machinery and its arrangement are adapted to direct engine or motor drive, and clutches, brakes, shafts, bearings and gears and other parts are made over-size. The drive from the engine or motor is by an entirely inclosed silent chain unit and all upper frame gears have machine-cut teeth, cut from solid blanks. These cranes are furnished with a two-speed travel gear to give a high speed for traveling light and a slower travel speed for pulling heavy loads or ascending comparatively steep grades. The two-speed travel gear does not affect the other speeds of the machine.

Locomotive Crane Designed for Gasoline, Diesel, or Electric Motor Drive

Steel Companion Flange Standards

Completion of the proposed American standard for steel companion flanges is reported by the American Society of Mechanical Engineers. The data in tentative form are being sent out for discussion and criticism. The work has been sponsored by the Heating and Contractors National Association and by the Manufacturers' Standardization Society of Valves and Fittings, as well as by the American Society of Mechanical Engineers.

Flanges covered in the proposed standards are for working steam pressures of 250, 400, 600 and 900 lb. to the sq. in., and as high as 750 deg. Fahr. The 250-lb. flanges have been classified for normal pipe sizes from 1 in. to 24-in. outside diameter; the 400-lb. flanges from 4 in. to 24-in. (for sizes below 4 in. the dimensions of the 600-lb. flanges are to be used); the 600-lb. flanges from ½ in. to 24 in.; the 900-lb. flanges from 3 in. to 24 in. (for sizes below 3 in. the dimensions of the 1350-lb. flanges are to be used).

Data covered in this tentative form include diameter and thickness of flange; diameter of hub, and length through hub.

Production Close to Buying Power

Slower Downward Movement of P-V Line, but Markets Cannot Absorb Much More Output—Automobile Over-Production Probable

BY DR. LEWIS H. HANEY
DIRECTOR, NEW YORK UNIVERSITY BUREAU OF BUSINESS RESEARCH

Favorable Factors

1. *Expansion of automobile production.*
2. *Gain in foreign trade in January, with a sharp increase in merchandise exports.*
3. *A more than seasonal increase in unfilled steel orders.*
4. *Building activity, though below a year ago, well maintained in January.*
5. *January railroad freight traffic increased more than usual.*
6. *Employment and payrolls of factory labor showed a rising trend in January.*

Unfavorable Factors

1. *The P-V line declined slightly, indicating that on the average the demand for commodities is not up to the supply.*
2. *Retail trade in January declined more than usual.*
3. *Money rates very high, gold imports stopped by Bank of England's higher discount rate, excessive volume of credit in loans on securities.*
4. *Continued over-production of oil, textiles, leather, etc.*
5. *Large stocks of goods in manufacturers' hands.*
6. *Uncertainties as to Federal Reserve Board policy in curbing speculative excesses.*
7. *Tariff uncertainties.*

CONTINUED good volume and condition of business are indicated for the next two or three months. Pressure from high money rates will be felt; evidences of this are already seen in reduced building activity. Considerable over-production exists, and a number of important industries are unfavorably situated in this respect. Retail trade has not been quite so active as it was most of the time in the second half of 1928. In general, production is close to the limits of markets to absorb what is made.

But commodity prices are quite stable and business is in large volume. Apparently profit margins, though often low, are not much different from those of the latter part of 1928. Consumer purchasing power remains high and employment decreased less than usual in January.

Immediate Prospects Appear to Be Good

Above all, the automobile industry is going ahead with its active drive for spring business, and its operations furnish a large demand for many materials and much labor. Probably the extent and duration of the current high level of business activity depends on the success of this industry more than upon any other condition. As there is every prospect that the automobile industry will increase in activity during the next month or two, the nearby prospects for business in general appear to be good.

Supply and Demand Nearly in Balance

CONTINUED slight decline in the P-V line indicates a condition more nearly approaching equilibrium between the demand and the supply in commodity markets. At the same time, the condition is still one in which the supply is fully up to the demand, leaving little room for expansion. In fact, at current prices, the demand appears to be a little less than the supply. Of course all commodities that are produced can be disposed of at some price, but not always at a profitable price. This is a fact of which a good many of the producers of sugar, paper, textile, leather and oil products are well aware.

The P-V line shows the relative intensity of supply and demand forces with relation to the current quantity or physical volume of commodities coming to market. Through it, we are able to deduce the adjustment between supply and demand, reasoning from the relative trends of the physical volume of trade and commodity prices. A decline in the P-V line means that the supply is too great to be sold at current prices.

As usual, the steel output has been following more or less closely the trend of this barometer, with a varying lag of several months. The adjusted index of steel production turned downward in January, and its trend has been slightly downward since last September. The more recent trend of the P-V line suggests approximate stability for steel production for a time.

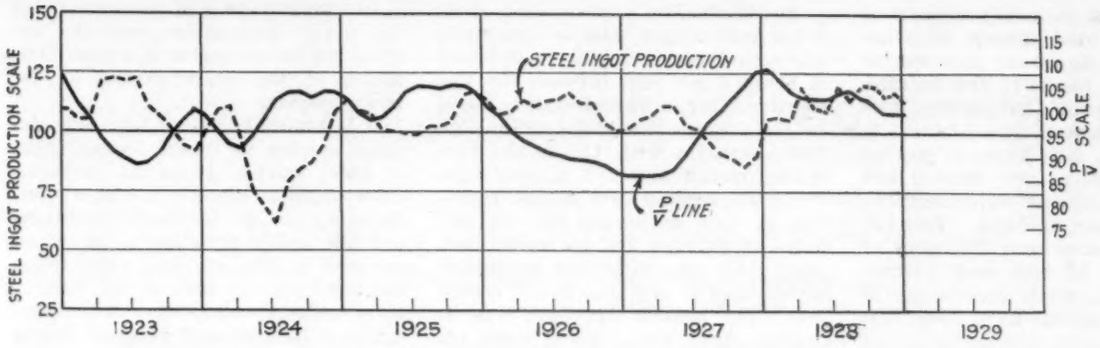
Record Output of Automobiles

PROPERLY adjusted indexes of automobile production and building activity both rose in January. While construction changed but slightly, automobile production showed a sharp spurt, rising to a new high record.

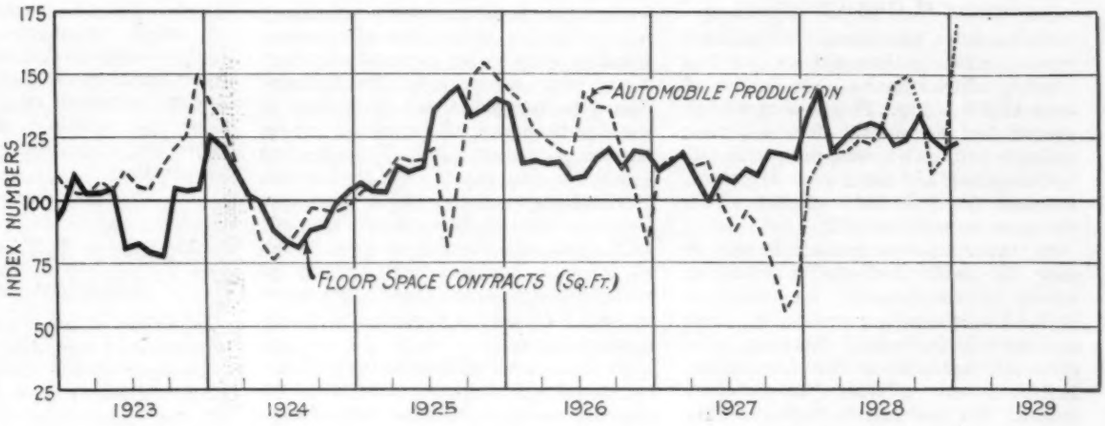
Building activity, measured in floor space, amounted to 58,774,000 sq. ft. in January, against 65,201,000 sq. ft. in December, and 63,717,000 sq. ft. a year ago. Thus it is appreciably below the volume of December and of January, 1928. But the decrease from December was less than usual, and our adjusted index for January (with average for 1921-1927 at 100) becomes 123.2, in comparison with 120.7 for December. It is none the less true that the January figure is 8 per cent under a year ago, in spite of the extra business day in that month this year.

Building permits, which do not include such heavy construction items as tunnels, pipe lines, bridges and the like, also decreased less than usual in January. In this case, the decrease was entirely due to a burst of building in New York, and it remains true that January permits made the poorest showing for that month that has appeared in any January since 1923. The average for the country is about 4 per cent under the low level of a year ago.

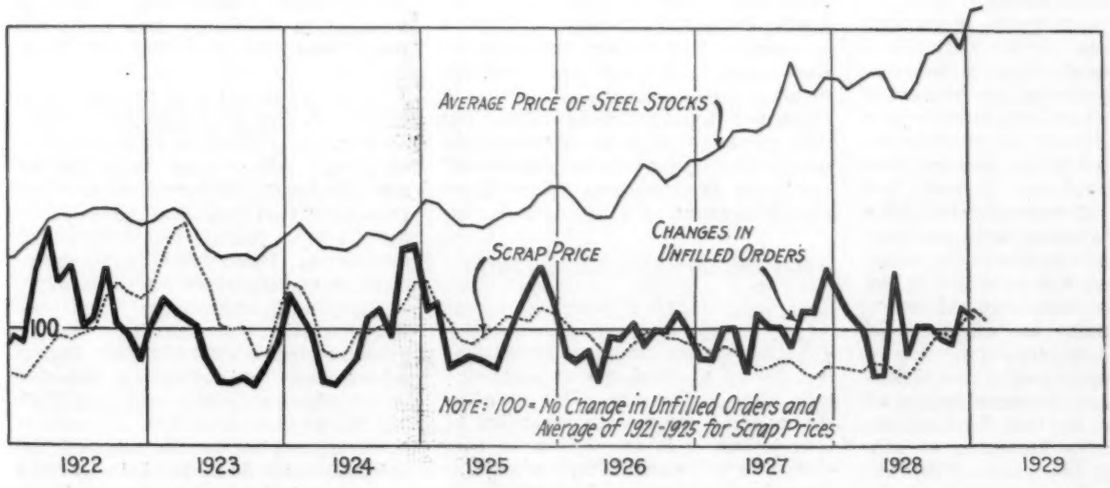
We think that the trend of building is still downward and is likely to con-



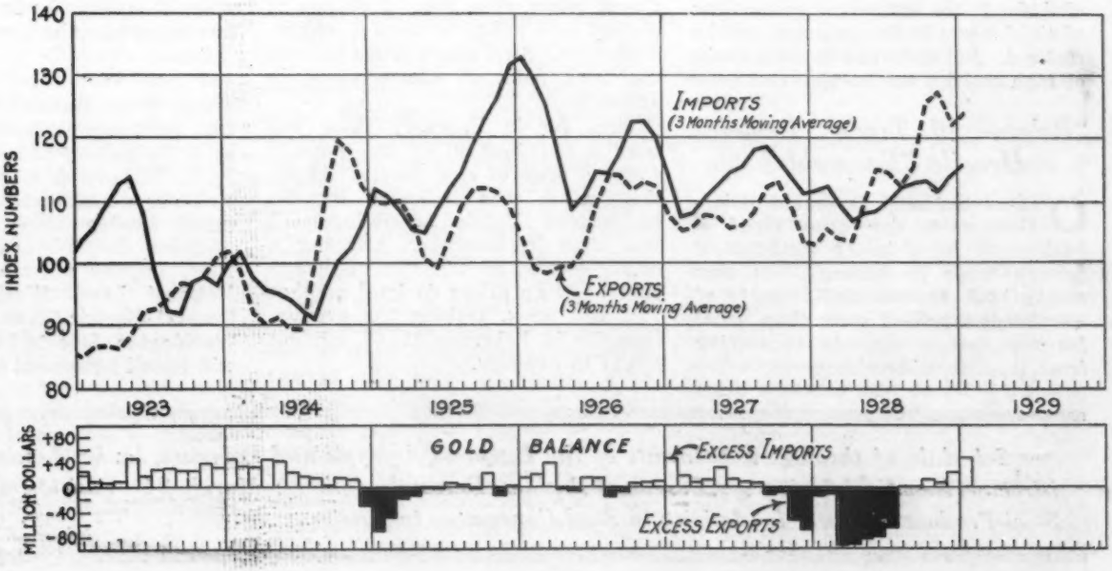
Continued Downward Movement of P-V Line Is Slower. Steel Production (Adjusted) Continues High Though Its Expansion Has Been Checked



Both Building Activity and Automobile Output Moved Upward in January, the Latter to a New High-Record Level. How Long the Pace Can Be Continued is a Question



Unfilled Orders, While Upward Again, Showed a Smaller Gain in January; Stock Prices Are Making New High Records and Scrap Prices Remain Higher Than for Several Years



Imports, Which Are Regarded as a Good Index of Domestic Industrial Activity, Were 10 Per Cent Higher in January. But Exports Remain Still Higher. Gold Movements are Slight and Contradictory

tinue so as long as money remains so tight. As to the money situation, there appears to be no prospect of easing during the next few months. It seems probable that money, considering the season, is at about as high a level as it is likely to go, but gold imports have been checked and the seasonal increase in commercial demands is near at hand. The Reserve Banks have been disposing of their holdings of bills and Government securities, while borrowings of the member banks have been increasing.

Danger of Over-Production

In January, the automobile makers turned out more than 400,000 cars and trucks, which means an average of over 15,400 a day. This is a new high record for the month. The adjusted index is 170, which compares with 117 in December, and 106 a year ago (with average for 1921-1927 at 100). Can the pace be maintained?

In favor of the manufacturers it may be said that the purchasing power of the average consumer is high. Also there is a probability that exports will increase. Certainly it is generally recognized that the manufacturers are offering unsurpassed values. On their part, they are putting forth extraordinarily heavy advertising and sales efforts.

Opposed, however, are a number of considerations. In the first place, there is now no shortage of automobiles such as existed at the beginning of 1928. That there is a troublesome accumulation of used cars may be inferred. Statistical indications are that automobile production is now far above its line of normal trend. To this fact we add the opinion that such production is much above its usual relation with building activity. It has been our observation that the curve of building activity has always indicated the general level that can be maintained by automobile production.

There appears to be more danger of over-production in this leading industry than there has been at any time in the last two years. The outcome seems to be uncertain. It is doubtful if the optimistic predictions of the leaders in the industry will be realized. But there can be little doubt of high activity for several months.

"Balance of Trade" Remains Heavily "Favorable"

ONE of the most favorable indications as to the future trend of business is found in the statistics of foreign trade in January. In that month both exports and imports of merchandise gained more than usual for the season, exports recovering from the December slump.

At $491,000,000, exports were about 3 per cent larger than in December, although there is usually a decrease of about 4 per cent between the two months. Our adjusted index, based on the average for 1921-1927, is 125. This compares with 115 in the preceding month and 104 a year ago. While January exports do not represent so high an annual rate as was found in October and November last year, they are, with that exception, higher than at any time in any recent year. The nearest approach was in October, 1924, when the adjusted index was 123.

Imports, at $371,000,000, increased nearly 10 per cent above December. Usually there is an increase of about 3 per cent; accordingly, the January figure represents a net gain that is greater than can be accounted for by the extra business day. The adjusted index for the month is 121, against 115 in December and 110 a year ago. This is the highest since August, 1927. Imports furnish a good index of domestic business activity. It is, therefore, significant that they appear to be a little above normal and on an upward trend.

Exports are still relatively high compared with imports. The trend of exports has been upward since January, 1928. While the trend of imports also has been a rising one since April, 1928, exports have increased somewhat more rapidly and a favorable balance of trade has been the result. Gold imports in January amounted to over $47,000,000, but this movement had no effect on the money situation, as it was neutralized by large ear-markings of gold on French account.

Barometers Rounding Off at High Point

OUR average of a representative group of steel stocks reached a new high in January. This reflected the general speculative situation, of course, but it is interesting to note that it is in line with the indications given by the barometers shown in the fourth chart. The rate of change in unfilled steel orders reached a peak in December. Steel scrap prices were at the high point of recent years in January.

Thus far in February there has been a rounding off in the monthly average price of steel stocks. Again, this action was indicated by the barometers. Unfilled orders increased less than in December, bringing a small decline in the rate-of-change curve. Scrap prices declined another 25c. last week, making the average thus far in February $18.67, against $19.31 in January.

Incidentally, this is another one of the many illustrations that the unfilled orders barometer is a good indication of the nearby trend of the scrap market.

It is too early yet to form any decided opinion as to the future trend of steel stocks. It seems probable, however, that there is too much uncertainty as to business conditions and the credit situation to allow an advance at the previous rapid rate, and until one or both of the barometers turns upward, there will be no sufficient indication of progress in the steel industry to warrant such an advance. But the present large volume of steel shipments at somewhat higher average prices should insure good earnings for the first quarter, and no certainty of a subsequent decline yet exists. Moderate gains, therefore, seem to be a reasonable expectation.

Predicts Billion Dollar Aviation Market

A billion dollar aviation market within two years, due to the rapid development of air transportation, air mail, aircraft production, flying schools, commercial aviation and accessories, was predicted by Major Albert Bond Lambert, a pioneer in aviation in St. Louis, in a radio address recently over Station WIL, there.

"It is estimated that 140 manufacturers of aircraft, airplane motors, accessories, scientific instruments, etc., will do a gross business of $300,000,000," Major Lambert continued. "This includes the sales to the Army, Navy, Department of Commerce, Post Office and equipment on additional air mail highways.

"Air mail contractors and air transportation companies expect gross receipts of $30,000,000. Flying schools and miscellaneous aviation and kindred activities will add $20,000,000 more.

"New capital to the extent of $150,000,000 will be needed by the present aviation companies, and another $150,000,000 will be provided to finance prospective companies."

The P. R. Mallory Co. of Indiana, Inc., Indianapolis, has been organized by P. R. Mallory and other officials of P. R. Mallory & Co., Port Chester, N. Y., to manufacture carboloy, a new metal cutting alloy, and elkon, a tungsten alloy for electrical contacts. New company will take over plant of National Lamp Works Division of General Electric Co. at Gray and East Washington Streets, Indianapolis, and will install equipment at an early date.

Schedule of the next instalments of the ***Business Analysis and Forecast****, by Dr. Lewis H. Haney, Director, New York University Bureau of Business Research, follows:* ***March 21****—Position of Iron and Steel Producers;* ***April 4****—Activity in Steel Consuming Industries.*

Asks Tariff Based on American Prices

Ad Valorem Rates, Says Steel Institute's Representative, Should Be Predicated on Domestic Conditions—Revision of Powers and Duties of Commission Sought

WASHINGTON, Feb. 26.—Application of import duties on iron and steel products in the forthcoming revised tariff act on a basis of American wholesale prices where ad valorem rates are adopted was asked by Thomas J. Doherty, tariff representative of the American Iron and Steel Institute, who appeared before the House Committee on Ways and Means in connection with its final hearings which relate to the administrative sections. It is expected that the hearings will come to an end either tomorrow or Thursday.

The testimony of Mr. Doherty supplemented in part that of John A. Topping, chairman Republic Iron & Steel Co., who, as vice-president of the institute, spoke for the American iron and steel industry when the hearings were begun on Jan. 14. At present, duties are based on foreign valuation, except as they apply to products in the chemical schedule.

Protests Rulings on Markings of Imported Steel

Modification of Sec. 304, regarding marking of the country of origin, was asked by George E. Dix, New York, American representative of the Steel Union Co. of Germany. He asked that the law be amended to require the Treasury Department to issue to importers upon request complete and precise rules for marking. Further, he asked that Sec. 516 be modified so that the right of domestic producers of iron and steel to protest rulings of the Treasury Department be denied. It was pointed out by Mr. Dix that the Secretary of the Treasury is designated by the law to prescribe rules and regulations for markings. In 1925, he said, the Treasury Department issued rulings under Sec. 304 relating to markings that have been followed by importers. Under Sec. 516, he stated, domestic producers, wholesalers and retailers, have the right to protest against the rulings of the Treasury Department where they concern classifications, appraisals, rates of duty, etc., but that nothing in the section gives the right to protest against rulings laid down by the Secretary of the Treasury regarding marking. The United States Customs Court, it was declared, has, however, passed upon rulings of the Treasury Department and in numerous instances held that the rulings of the department were not in accordance with the law as set forth in Sec. 304.

Mr. Dix said that the Bethlehem Steel Co. and the Youngstown Sheet & Tube Co. have, as a result of this precedent, protested practically every importation of steel that came to the United States during the past year and have haled importers into court to defend themselves for having followed instructions of the Treasury Department. It has been impossible, Mr. Dix said, to obtain instructions as to markings that would be acceptable to the United States Government. The situation was declared to be intolerable in that the Customs Court has issued rules and regulations which the court has in some instances set aside without stipulating how the steel should be marked. The court, it was stated, simply has instructed importers to follow its rulings without saying how it could be done. It was stated that in the event the interpretation of importers of the section differs from the judgment of the United States Customs Court they are liable to an additional duty of 10 per cent of the appraised value of the imported merchandise. Importers, it was stated, have been put to heavy expense and annoyance in being required constantly to defend themselves.

The proposal of Mr. Dix, if adopted, would definitely remove from the United States Customs Court the right to pass upon the actions of the Secretary of the Treasury as to marking imported merchandise at the instance of American manufacturers, wholesalers or retailers.

Recommend Changing Powers and Duties of Tariff Commission

Various recommendations for revision of present administrative sections of the existing tariff act were made to the committee by the National Association of Manufacturers through its president, John E. Edgerton, and its general counsel, James A. Emery. They appeared as spokesmen of the National Tariff Conference, held under the auspices of the association in New York on Nov. 26, 1928. In addition to Mr. Edgerton and Mr. Emery, other members of the subcommittee which drew the recommendations included prominent industrial men of the country, among them James A. Campbell, president Youngstown Sheet & Tube Co.; W. W. Nichols, assistant to the president Allis-Chalmers Mfg. Co., and J. W. Hook, president Geometric Tool Co. The views reflected in the recommendations represent those of 35,000 manufacturing corporations of the United States.

The recommendations would make the Tariff Commission non-partisan rather than bi-partisan, and its membership would be increased and made an odd number. Salaries of the members would be increased to attract "those best qualified for these highly important functions." The commission would, in addition to its investigatory functions, be given semi-judicial functions in relation to the readjustment of duties which, it was stated, is now implied but not directed by existing law. Under the flexible provision (Sec. 315) it was stated, the commission makes a report to the President as to whether or not an existing rate effectuates the policy of Congress. The recommendations proposed that the commission be authorized to interpret the facts which it finds by recommendation to the President which he may, however, reject and which will carry such weight to the public and the President as is measured by the quality of the investigation and the recommendation. It was also recommended that the power of the President under the flexible provision be so enlarged as to enable him to remove articles to or from the free list after preliminary investigation and recommendation by the commission when such action is essential to execute the policy established by Congress. It was asserted that such a change would be a valid exercise of Congressional power which would provide a more effective remedy without the necessity for special legislation "which experience has demonstrated to be difficult if not impossible to apply as a corrective without reopening a fixed tariff policy to pressures and suggestions for general revision."

Cost of Production Declared Unworkable Formula for Fixing Duties

It was further recommended that the present formula governing the action of the President in the adjustment of rates, that is, the difference in cost of production in the United States and the competing foreign country, be repealed and that a workable standard be substituted. Experience was declared to have demonstrated that neither in general nor particular industries is there a standard or uniform domestic or foreign cost of production, that such cost varies greatly within the same industry at different times and in different places, that foreign costs are sub-

stantially unobtainable, and that such as are known reflect the greatest variability in unstabilized foreign countries, while the formula itself is not a sound basis for tariff adjustment. It was submitted that, accepting the protective principle, the purpose is to produce revenue and preserve opportunity for American industry to meet fairly foreign competition in the markets of the United States while operating under conditions which assure the preservation of American standards of living.

It was explained that the proposals obviously do not involve taking from Congress the power to determine and define the tariff policy of the United States. They do not, it was stated, give the Tariff Commission or the President any power to change rates arbitrarily or at will. They lodge in the executive, Mr. Edgerton said, the same power possessed under the existing tariff act enlarged to include removal to or from the free list after investigation and recommendation by the Tariff Commission but only in pursuance of the policy fixed by Congress. It is not suggested, he pointed out, that the commission be given any power to make rates or even by itself to adjust them, but only to investigate and recommend adjustments in conformity with Congressional policy and which are to be made effective only by executive authority and proclamation. The commission's power of inquiry and recommendation, it was stated, would continue to be safeguarded in the same manner as in the present law and is set in operation by the direction of Congress under regulations made by the President.

Mr. Emery asserted the constitutionality of the proposal to enlarge the powers of the President acting upon the recommendations of the commission in the adjustment of duties. He declared Congress may confer upon the President in the administration of tariff legislation the power to remove articles from the free list and change or withdraw duties levied upon such commodities, upon investigation and recommendation by a Tariff Commission in conformity with the execution of a tariff policy fixed by Congress.

Importer Asks Repeal of Flexible Provision

George C. Davis, representing the National Council of American Importers, urged that the flexible provision be repealed. He expressed the view that it has not accomplished its purpose of adjusting rates. He complained also that the average time to make the adjustments has ranged from two and one-half to three years. It was declared that the commission could accomplish more as a purely fact-finding body, furnishing information to Congress upon which to enact tariff legislation.

It is understood that the various subcommittees of the Ways and Means Committee will begin revision of the schedules on March 6. It is hoped to complete them as soon as possible, but whether or not the revised bill will be ready for introduction in the House when the special session of Congress convenes is not known. Present indications are that the special session will be called for the middle or latter part of April.

Iron and Steel Roofing Standards

Simplified practice in galvanized and painted roofing made of iron and steel sheets has resulted in reducing the number of different sizes and gages of sheets. A pamphlet issued by the Simplified Practice Division of the Department of Commerce and obtainable at 5c. from the Superintendent of Documents, Government Printing Office, Washington, gives the particulars.

Only four sheet gages are used, these being Nos. 24, 26, 28 and 29, the latter in roll form only. Lengths are held to 5, 6, 7, 8, 9, 10, 11 and 12 ft. Rolls are to be only 50 ft. in length. Widths for corrugated roofing are 26 and 27½ in. only. Rolls are of the single width of 26½ in. and all other forms are 24 in. The styles and forms, aside from corrugated and roll, are the V-crimp and the pressed standing seam.

Sharon Shop to Fabricate 4200 Tons of Welded Pipe

The Mahoning Sanitary District, Mahoning County, Ohio, has placed with the Penstock Construction Co., Sharon, Pa., an associate company of the Petroleum Iron Works Co., two twin lines of 36-in. diameter, electrically welded pipe, 53,440 ft. long, ⅜-in. thick, together with the following additional short lengths and sizes: 370 ft. 36-in. diameter pipe, ½-in. thick; 135 ft. 48-in. diameter pipe, ½-in. thick; 745 ft. 48-in. diameter pipe, ⅜-in. thick; 300 ft. 24-in. diameter pipe, ⅜-in. thick. The total weight of this order is 4200 tons.

Much Larger Steel Castings Orders

WASHINGTON, Feb. 26.—Orders for commercial steel castings in January totaled 125,800 tons, or 86 per cent of the monthly capacity of the manufacturers reporting to the Department of Commerce. This compares with 96,373 tons, or 65 per cent of capacity, placed in December.

Production also showed a substantial increase in January, amounting to 93,410 tons, or 64 per cent of capacity, against 82,203 tons, or 56 per cent of capacity in December.

Of the orders booked in January, 66,293 tons was for railroad specialties, representing 98 per cent of this class of capacity, while 59,507 tons was for miscellaneous castings, being 76 per cent of this class of capacity.

Railroad castings produced in January totaled 35,689 tons, or 53 per cent of such capacity, while miscellaneous production was 57,721 tons, or 73 per cent of such capacity.

Three Farm Implement Makers to Be Merged

The Oliver Chilled Plow Works, South Bend, Ind.; the Nichols & Shepard Co., Battle Creek, Mich., and the Hart-Parr Co., Charles City, Iowa, large makers of farm implements, are to be consolidated. The Oliver Chilled company was founded in 1855 by James Oliver, who was the inventor of chilled plows. The Hart-Parr Co. was organized in 1901 to manufacture farm tractors, and the Nichols & Shepard Co. was founded in 1848. The consolidation has been agreed upon by the officials of the companies, but details of the merger will not be announced until after the stockholders' meeting, which will be called in the near future to ratify the agreement.

New Steel Plant to Be Built at Ecorse, Mich.

It is announced that the erection of a steel plant in Ecorse, a Detroit suburb, is contemplated by a company that will be incorporated as the Great Lakes Steel Corporation, at the head of which will be George R. Fink, president Michigan Steel Corporation, which operates a sheet mill at Ecorse. The plant, it is understood, will include an open-hearth department, semi-finishing and finishing mills. The finished products are to include structural shapes, light plates and hot-rolled flats.

Metal-Working Industry Meeting at Chicago

The commercial status of carboloy is to be discussed at a meeting March 18 at the Engineering Building, 205 Wacker Drive, Chicago, held under the auspices of the Western Society of Engineers, and the American Society of Mechanical Engineers, by G. N. Sieger and E. G. Gilson, Carboloy Co., New York.

Other topics and authors have been announced as follows: "Cylindrical Grinding," R. E. W. Harrison, Cincinnati Grinders, Inc.; "Principles Involved in the Design of Products Made of Pressed Metal," R. I. Miner, Youngstown Pressed Steel Co.; "Nitriding of Steel from the Point of View of Its Practical Application," H. W. M'Quaid, Timken Detroit Axle Co.; "Testing and Testing Methods Featuring the Magnetic Method of Detecting Flaws in Steel and Determining Physical Properties," A. V. de Forest, American Chain Co.

A 7500 kw. turbo-alternator unit to be installed at the East St. Louis plant of the Aluminum Co. of America will be furnished by the Allis-Chalmers Mfg. Co., Milwaukee.

This Issue in Brief

In mechanical oxy-acetylene welding of heavy sheet metal, the best results may be obtained by using two blow pipes, one above and the other below the plate. In good practice more than half the heat is generated by the lower torch. On 14-gage and thinner sheets, satisfactory joints are made with flame on upper surface of seam only.—Page 593.

* * *

Basic open-hearth losses may conveniently be grouped as metalloid losses, iron lost in slag, spillage, oxidation and losses due to foreign material and as miscellaneous. After adding condemned ingots and ingot butts and providing for loss on "additions," the total may be subtracted from the gross metallic mixtures to give the ingot yield.—Page 596.

* * *

Current business activity still rests largely on basis of automobile production and building construction, according to conference of industrial statisticians. As these industries have been largely supported by use of credit, continuance of their activity depends principally upon future trend of credit and financial conditions.—Page 612.

* * *

Irregularity in blast furnace operation is likely to cause imperfection in finished steel, investigation shows. Silicates in the iron are higher when the blast furnace is operating irregularly and experiments indicate that this will lead to higher silicates in steel, with resultant trouble.—Page 606.

* * *

Capacity for production of oxy-acetylene welded pipe has expanded from 150 ft. per hr. in 1915 to 600 or 700 ft. per hr. on latest machines. Acetylene burned an hour has more than doubled and the number of flames per tip has increased from four or five 14 years ago to a present maximum of 20.—Page 591.

Disproves opinions once current that austenitic manganese steel cannot be changed into the other well known transformation products by any process of heat treatment. Howe Memorial lecturer finds that a long anneal at 500 deg. C. will convert a soft non-magnetic metal into brittle material, with greatly increased hardness.—Page 601.

* * *

Over-production threatens automobile industry, says forecaster. In spite of high consumer purchasing power, increased exports and unsurpassed values, production is far above normal trend. However, the industry will probably operate at a high rate for several months.—Page 620.

* * *

Mechanical oxy-acetylene welding is now used successfully on steel plate up to ⅜ in. in thickness. With torches consuming 3.3 cu. ft. oxygen and 3.2 cu. ft. acetylene a minute, plain butt welds can be made in ¼-in. steel plate at rate of 24 in. a minute and in ⅜-in. plate at 11 in. a minute.—Page 594.

* * *

Estimating weights for any major portion of the metallic charge in basic open-hearth furnace results in fictitious yields for individual heats. Such practices necessitate large adjustments to balance materials on hand, with yield reports seriously disturbed. Minor adjustments are necessary even with most careful weighing.—Page 596.

* * *

Regrinding of tungsten carbide tools should consist of three operations, the rough grind, the finish grind and stoning or honing. According to abrasive engineer, the rough grind is necessary to bring tool to its proper shape, and a finish grind on a fine grit wheel followed by a hand stoning operation should give tool its proper cutting edge.—Page 599.

Portable dynamic balancing outfit utilizes stroboscopic principle to explore vibration in machines. This consists of illuminating rapidly moving objects by a series of instantaneous light flashes, so timed that they are synchronized with the motion of the moving objects.—Page 610.

* * *

Gains in foreign trade and unfilled steel orders, expansion of automobile production, maintained building activity and increase in railroad freight traffic indicate continued good volume of business, says Dr. Haney. However, high money rates, uncertainties in the financial market and continued overproduction in some lines are unfavorable factors.—Page 618.

* * *

Experiments demonstrate that temperature at various locations in the blast furnace varies with gas velocity, while amount of carbon dioxide is in reverse proportion to these velocities. Uniform gas flow with better contact insures larger output with less coke.—Page 602.

* * *

January production of motor vehicles, amounting to 402,154 units, establishes record for that month. Output was 71.9 per cent ahead of December and included 350,617 passenger cars and 51,537 trucks.—Page 653.

* * *

Foaming heats in open-hearth operations may be caused by so rapid an evolution of gases, particularly in carbon elimination, that the slag is unable to pass the gas through at such a high rate. Surface tension of the slag and its viscosity are also factors.—Page 604.

* * *

Grinding of tungsten carbide tools requires a rigid machine to prevent excessive wheel wear. Tool should also be on a solid rest and should be approached to wheel carefully, allowing heel to come in contact first. Otherwise a ragged and chipped-edged tool will result.—Page 599.

A. I. FINDLEY
Editor

THE IRON AGE

W. W. MACON
Managing Editor

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Machine Tools—A Heartening Barometer

APPREHENSION regarding the effect of stock market speculation on business, which caused the Federal Reserve Board to sound its recent note of warning, has become general. Curtailment of building activity, although as yet very moderate, is cited as an outstanding consequence of high money rates. Although automobile production is admittedly at a high rate and railroad equipment buying is in impressive volume, there is a disposition to doubt whether such activity can continue. Confidence has been disturbed and, insofar as this fact has held the stock market in check, it has been salutary and in keeping with the intent of the Reserve Board. Traders have become cautious, not so much because of what the reserve banks have actually done, but rather on account of continued uncertainty as to what they may do.

Advances in the rediscount rates of the reserve banks are still taken into account among possibilities, although regarded less likely than a fortnight ago. They would have the effect of raising further the cost of credit for ordinary business requirements. In fact, the Reserve Board's effort to squeeze out speculative loans by member banks would be surer of success, it is contended in some quarters, if rediscount rates were reduced instead of advanced. In such a case there would be less temptation for the banks to try to circumvent the restrictions of Reserve policy to take advantage of high call money rates. However successful the Reserve system may be in its efforts to isolate speculative credit for remedial attention, direct loans to brokers from individuals and corporations, which have assumed such large proportions in the past year or two, will remain beyond the control of the banks. Meanwhile it is possible the Reserve Board expects results by leaving in doubt what it will do or when it will do it.

With the money market in the limelight, some of the most favorable aspects of the business situation are escaping due notice. Although in the present frame of mind of many observers there is a disposition to pass off the activity in steel, automobiles and railroad equipment as "merely temporary," the same attitude cannot be safely taken toward machine tools. In the past the tooling of new plants or the retooling of old plants has been one of the first manifestations of a cycle of industrial expansion.

Preliminary reports for the month of February indicate that machine tool sales exceeded those of the previous month for the tenth consecutive time. The fact that demand for tools continues to grow, in the face of conservative business sentiment, is considered evidence of its sound basis in actual needs, rather than in over-optimistic expectations, such as influenced machine tool trade in 1919 and 1920. Machine tool orders, moreover, are coming from a wide diversity of buyers, indicating a broad distribution of business activity.

In view of this showing, it is entirely possible that recessions in large industries such as building, which are conspicuous because they are measurable by statistics, may be offset by expansion in miscellaneous lines. The importance of the unclassified industries is indicated by the fact that in 1928 they accounted for 18½ per cent of all the finished steel consumed, or more than any one of the classified outlets. Among such minor industries, a new one and a rapidly growing one, airplane manufacture, is an outstanding buyer of machine tools.

As to the portent of machine tool activity, it may be added that it has hitherto always proved sensitive to a slowing down of industry, and there is no reason to expect it will not repeat as a barometer. Machine tools are slow to respond on the upturn but are about the first to feel the downturn—and they do not yet indicate recession.

Immigration As a Major Concern

THE subject of immigration is to come before the new Congress and we shall have the usual mass of discussion and argument—chiefly the latter. The custom of magnifying the subject in hand, to the minimizing of other things, is one that no nation can get away from, least of all the American nation, and no doubt we shall see an example in this matter.

There are many other things with which we should concern ourselves deeply. For one quantitative relationship note this: In the four years through 1927 immigration each year averaged 0.28 per cent of the population, while in the three years through 1926 (using the latest data available) in cities of over 100,000 population, aggregating about 25,000,000, the proportion of homicides and suicides per annum was 0.027 per cent, or about one-tenth as much. Is not a homicide or suicide more important socially than the immigration of ten persons?

By the latest data paupers in almshouses are 0.07 per cent of the total population, and roughly speaking the number of deaths in these institutions indicates an average stay of only about five years, so that the people who at one time have been inmates amount to several times 0.07 per cent of the population. Those committed to penal institutions in a year represent 0.33 per cent of the population and the number in at

one time represents 0.10 per cent of the population. By the 1920 census illiteracy was as follows: Native white, 0.8 per cent; negro, 22.9 per cent; foreign-born white, 13.1 per cent.

These figures are not cited to prove anything precisely or to reach any definite conclusion, except that when the subject of immigration is up people are prone to magnify its importance and to miss a realization of other things that should concern us—homicides, suicides, pauperism, crime and illiteracy.

In point of numbers a vastly bigger subject still is that of unemployment: First, as to the total number without work; second, as to what class of people they are, native or foreign born, literate or illiterate, good or criminally inclined; and, third, as to the kind of work they are capable of performing.

Our so-called "employment statistics" are lamentably deficient; but from any angle what is more important than employment and unemployment? All the time we are stressing production statistics and trade prospects as a matter of employment, yet we have almost no measures at all of the thing itself. Already people are saying that we must await the results of the 1930 census. That is decennial. We have census of manufactures more frequently, with trade data of various sorts monthly or even weekly.

By all means let us have the most enlightened immigration policy possible; but let us not think, as some discussions of the subject have seemed to imply, that we shall be all right socially and industrially if we get it settled right.

Old Age Pension Problems

LEGISLATION already enacted in the United States and Canada granting old age pensions is based upon an identical bill, framed and fostered by the Association for Labor Legislation. Six States—Colorado, Montana, Wisconsin, Kentucky, Maryland and Nevada—have put such a law upon their statute books, but similar legislation has been declared unconstitutional in Arizona, Pennsylvania, California, Washington, Wyoming and Ohio.

Proponents of the legislation seek the payment of a pension out of the public treasury to every aged person who has failed to provide for his or her old age. Such payment by statute is evidently taken as likely to remove any stigma attaching to so-called poor relief. Yet it remains that what is required is proof of needy circumstances rather than a showing of years of diligent and faithful service. It is to be said in this connection that administrators of municipal and charitable organizations find many evidences of a breaking down of that side of human nature which resents or abhors any form of financial help having a taint of pauperism. Frequent recipients of charity seem to find in it nothing to shock their self-respect.

Where the law has operated the results have been miserably inadequate, for aged men and women receive only $1 a day with which to sustain themselves. Other weaknesses have developed, but apparently administrative defects were expected at the outset and were disregarded in the effort to drive in an entering wedge.

The contributory plan, in which State, employer and beneficiary share in building up a pension fund, seeks to eliminate the pauperism factor, but administration would still be no simple matter. There is, for example, the case of the industrial worker who has paid into a pension fund while employed in one plant and who is to be given credit for the amount when he changes to other employment, as might happen a good many times between young manhood and old age. Not only in respect to its administrative phases but much more because of its social and economic implications, the question is still quite remote from practical consideration as an industrial factor.

Uniformity in Furnace Burdens

LAST week the results of an exhaustive series of experiments on a 700-ton blast furnace were revealed before the mining engineers in a paper reviewed on other pages in this issue. The importance of gas-and-solid contacts in the furnace stack was emphasized in several new aspects. Uniformity of size in the ore particles appears as a major factor in promoting furnace efficiency. In one furnace, with the ore charged in uniform size particles, the ore reduction was over 76 per cent at a point only about 21 feet from the stock line. In the 700-ton furnace, with charging of miscellaneous lumps of ore, dust included, the reduction was only 4.6 per cent at the corresponding level.

Opinion is crystallizing that blast furnace practice will take into account more and more the proper sizing of the burden, to bring about even distribution of the gases as well as the solid materials. In the direct, or low-temperature, reduction of ores, the gas-solid contact is of prime importance—uniformly fine ore permeated with a reducing gas. One important item contributing to rapidly expanding efficiency and greater output of the individual furnace in Germany is the care taken in the selection of ores, particularly as to their size. This involves extra expense and possibly more equipment, but it is probably compensated for by the results.

What Can I Learn From the Other Fellow?

HOW often have we observed that, whenever a subject which requires an understanding of metals is under consideration by an assemblage of chemical or civil or mining engineers, the metallurgy is expounded in the most superficial manner and couched in terms taken from 30-year-old text books! An apologist might say that a chemist could be pardoned for knowing little about brass if he knew a lot about sulphuric acid. But surely the parallel should not extend to the civil engineers—metal is one of their principal materials of construction. Nevertheless for every one of them who knows more than a smattering about steel you can find a dozen who know a great deal about the vagaries of cement. It is easy to get an opinion about early strength cement, about proportioning aggregates by voids, and about limiting the amount of water in the concrete mixer, but sad to relate, it is even easier to find civil engineers to whom steel is just steel.

Mechanical engineers are not beyond criticism in this matter, even though their constant work in

fabricating metals gives them a closer appreciation of the problems of the metallurgist. Admitted that many skilled metallurgists have been recruited from the mechanical engineers, that many mechanical executives are well informed about metals or have specialists advising them on such matters, yet too many designers, foremen and engineers are blissfully unaware of the limitations of the metals they are now using, or of alternative alloys better adapted to the purpose.

Doubtless specialists in metals are equally shallow in their understanding of the operating problems of the machinist, the constructor or the chemist, else they would not be so impatient with that "conservatism" or "inertia" which prevents the other industries from adopting innovations as rapidly as they are proposed. The point is that there is a real need for a wider dissemination of knowledge about what is going on in various branches of activity. Intense specialization, "knowing more and more about less and less", has obvious disadvantages. Large and powerful organizations can avoid stagnation by collecting several specialists in various branches, although this is beyond the means of most.

There are at least three other ways of solving the problem, each of them worthy of wider adoption. The first gets at the problem at the source, by giving a more fundamental (and therefore broader) education in college. Specifically, one way to teach "strength of materials", which all engineers study, is to let the student acquire a certain facility with testing machines. A better way is to show how materials of construction vary in physical properties, depending upon their constitution and previous history. The better way takes no more time than is given to the former; it does require more intelligent preparation on the part of the instructor, yet it would turn out embryo engineers who know the difference between austenitic 12.5-per cent manganese steel and pearlitic 1.5-per cent manganese steel.

A second way to broaden out is by intermingling. A civil engineering group, for instance, can sometimes forget to talk shop, and invite some well informed chemist or banker or aircaft builder to tell them about *his* specialty. Joint meetings of local engineering organizations are also helpful. Even national organizations can do the same: witness the annual meeting of Steel Treaters, Institute of Metals, and Welding Society.

Finally, there are the trade and technical publications, available to everybody, even to those so isolated that active membership in a professional society or business organization is impossible. Through them a wealth of information is continually spread before American readers, with a promptness and completeness unapproached in any other country. Annual subscriptions totaling no more than $50, and a little time by a subordinate to blue-pencil the pertinent items, will keep any reader abreast of the times. And a man who does not read becomes a back number in three years, no matter how much golf he plays, or how many "movies" he sees.

Correspondence

Special Indexing of Business Papers

To the Editor: Your journal is one of the 1700 indexed by the Engineering Index Service, which the Newark Library has subscribed to since it began in January, 1928.

The inclosed notice,* if published in your journal, will make known to your readers, especially to those in New Jersey, that this monumental service makes readily accessible to them all important technical literature published by you and the hundreds of other journals indexed.

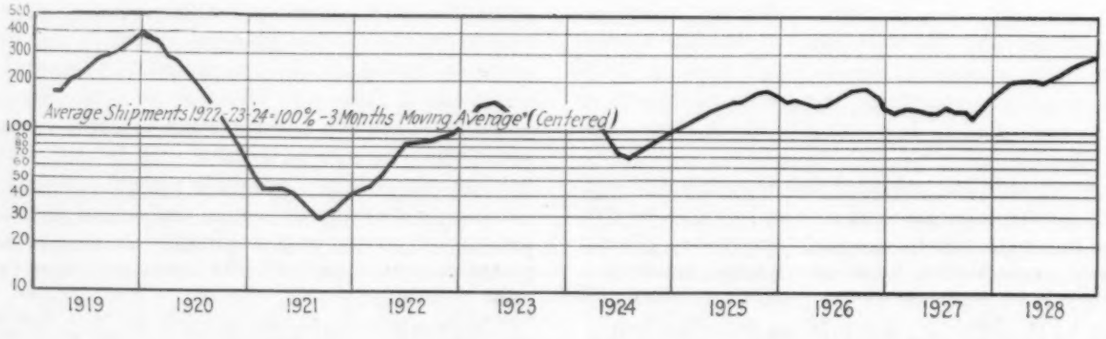
J. C. DANA,
Librarian

Public Library of Newark, N. J.

*This notice points out that the index service is to be found in the public libraries of Newark, Cleveland, Bridgeport, Baltimore and the John Crerar Library, Chicago.

Machine Tool Orders Increase for Ninth Consecutive Month

IN past years a pronounced falling off in general business has nearly always been preceded by a decline in the volume of machine tool buying. No such drop in machine tool business is yet indicated, and the National Machine Tool Builders' Association, in discussing the condition of its industry, says "there seems to be no reason to think that demand should not continue at a high level for as far ahead as can reasonably be foreseen, say four to five months." For nine consecutive months the unfilled orders in machine tools have shown an increase over the previous month. For January they stand at 2.65 times shipments, indicating that the average orders are for nearly three months' delivery. Shipments in January were at 255.4 with 100 representing the average for 1922-24.



More Common Stock for Steel Corporation

Plan Is to Retire Bonded Indebtedness — Will Be Presented to Stockholders' Meeting

AT the regular meeting of the directors of the United States Steel Corporation held at 71 Broadway, New York, Feb. 26, approval was given of a plan for submission to the stockholders for an increase of the authorized common stock of the corporation to 12,500,000 shares (par value $100 each). The present authorized issue is 7,533,210 shares, of which 7,116,235 shares are issued and outstanding.

Upon the increase being effected, it is the present intention of the directors to offer to the common stockholders the right to subscribe for additional shares. The amount, the ratio to present holdings, and the price, terms and dates of payment, are to be fixed in the offer when made.

"Funds received from the sale to stockholders of the shares of common stock thus to be offered," says the statement, issued by Myron C. Taylor, chairman of the finance committee of the corporation, "together with such portion, as the directors may then decide upon employing, of the cash resources of the corporation in hand representing surplus and other reserves (part of which cash resources has already been used in the purchase of bonds) will be employed to redeem by purchase for cancellation and to call for retirement all or part of the bonds of the United States Steel Corporation as the directors may elect, of which there were outstanding Dec. 31, 1928, exclusive of those held in the sinking funds and in the corporation's treasury, the following:

Fifty-year 5 per cent gold bonds of 1951.....$134,830,000
Ten-sixty-year 5 per cent bonds of 1963..... 136,555,000

"Of the 50-year 5 per cent bonds of 1951 outstanding, the series A, C, and E, constituting the major portion of the issue, are subject to call on any interest date at 115 and accrued interest, while arrangements have been made with the holders of nearly all of the non-callable bonds, series B, D, and F, to surrender their bonds for retirement at the same price and/or to provide for deposit of funds with the trustee for the redemption, at the price named, of any bonds which may not be promptly surrendered. Under the plan arranged for, all of the bonds of the 50-year issue will be retired, or provision made for their retirement, by Sept. 1, 1929.

"The 10-60-year 5 per cent bonds of 1963 are callable in part or in whole on any semi-annual interest date at 110 and accrued interest. It is the present intention of the directors, subject to the stockholders authorizing the proposed increase in common stock, and the subscription by stockholders and sale by the corporation of the shares of such stock which it may be determined upon to offer for subscription as before stated, to call in part or whole the 10-60-year bonds for redemption on Nov. 1, 1929.

"The retirement of the entire issue of the 50-year 5 per cent bonds of 1951 will result in relieving current annual earnings of the necessity of supplying cash funds for interest and sinking fund requirements on the bonds, which now equal annually the sum of .....$18,237,350. And the similar annual charges on the entire issue of the 10-60-year bonds of 1963 amount to..... 11,010,000, making a total annual reduction in fixed charges which will result from the retirement of the entire amount of both issues, of..$29,247,350.

"In case of such retirement, the charge for the dividends which may be paid on the additional common stock contemplated to be issued in connection with the plan outlined would reduce the above amount of savings of net income, but the exact amount of such dividend payments on the additional common stock cannot be stated pending final determination by the directors of the conditions attending the offering of common shares for subscription. The amount of savings in net income will, however, be in excess of the amount of dividends at the present rate, to be paid on the increased common stock which may be presently offered for subscription.

"The plan will afford greater protection to the preferred stock by eliminating the prior lien of the bonds and a large fixed charge now having preference over its rights and likewise will improve the position of the common stock and increase the net income available for dividends on common stock after providing for the added dividends required for the new common shares contemplated to be issued.

"The remainder of the increased authorized issue of common stock will be used for future corporate purposes as and when the directors may deem advisable, but no issue other than for debt retirement and for employees' stock subscriptions, referred to below, is contemplated at this time.

"The directors also authorized the submission to the stockholders at the forthcoming annual meeting, of a revision of the corporation's employees' stock subscription plan, which will give to the directors the option, permitted under the New Jersey statutes, of issuing shares of capital stock to be offered employees for subscription under the plan, or the securement of the needed shares by purchase in the open market."

President Farrell on Conditions

Following the presentation of the plan, President James A. Farrell spoke briefly on the business situation in steel. Conditions as affecting the corporation's subsidiaries, he said, and as far as observations go of the corporation's competitors, made him believe we are in a period of satisfactory operations for several months. "Our plants," he continued, "are operating practically at capacity, as there is always a percentage of the furnaces undergoing reconditioning, and mills and mines are similarly affected. Some lines are not so active as others but ingot output is fully occupied. Prices are on a reasonably satisfactory basis, and satisfactory returns should be made on the investments in the business."

To Hold Aeronautic Meeting in St. Louis

An aeronautic meeting for engineers is being planned for May 27 to 30 by the St. Louis section of the American Society of Mechanical Engineers in cooperation with the Aeronautic Division of the society. A general committee has been appointed with Major A. B. Lambert as honorary chairman and Victor J. Azbe as general chairman; other members on the committee are Frederick E. Bausch, vice-chairman, P. DeC. Ball, Col. J. A. Paegelow and Major C. R. Wassal.

Conferences will be held during the meeting for the aeronautic experts on such subjects as structural analysis of aircraft, the status of light Diesel engines for airplanes, maintenance and location of airports, fog flying and ice formation on airplanes, installation and servicing of aircraft instruments, etc. During the meeting the Gardner Cup Air Races will be held at the Parks Airport, May 28 to 30.

Berger Mfg. Co. Buys Metal Furniture Plant

The Berger Mfg. Co., Canton, Ohio, subsidiary of the Central Alloy Steel Corporation, has purchased the metal furniture division of the Van Dorn Iron Works Co., Cleveland. The purchase includes all the Van Dorn machinery used in making metal furniture and inventory in process. The purchase price was approximately $1,000,000. For the present, the manufacture of the Van Dorn line of metal furniture will be continued in Cleveland.

Bituminous coal shipped to Great Lakes ports in 1928 for loading into vessels as cargo made the greatest total for a number of years, according to figures from the Ohio Bureau of Coal Statistics. More than 55 per cent of 1928 shipments came from West Virginia. About 20 per cent was shipped from eastern Kentucky and another 20 per cent from Pennsylvania.

Iron and Steel Markets

Steel Production Increases

Output at 95 Per Cent at Chicago and 90 Per Cent at Pittsburgh—Concern Over Deliveries Causes Buyers to Place Protective Orders—Semi-Finished Up $1

MILL output is again rising, responding to the growing pressure for deliveries, particularly of automobile steels. Ingot production at Chicago now stands at fully 95 per cent of capacity, compared with 92 per cent a week ago, and the general average for the Youngstown, Pittsburgh and Wheeling districts, influenced by a recovery from a temporary recession in the Valleys, has gone up five points to 90 per cent.

Steel prices continue to gather strength. Wider adoption of advances of $2 a ton on the common finishes of sheets and $1 a ton on bars, plates and shapes has been followed by an increase of $1 a ton on sheet bars, billets and slabs.

Heavy specifications for sheets, strip steel, carbon and alloy steel bars are coming from the automobile industry, as well as other consuming lines. Automobile production still shows an upward tendency, at least for some manufacturers.

The January report of independent makers of flat rolled steel showed large gains in sales, production, shipments and unfilled tonnage. The total of unfilled orders Feb. 1, at 652,600 tons, represented an increase of 60,000 tons for the month. Output in February has been virtually at capacity and, despite heavy shipments, deliveries have continued to lengthen, now ranging from four to eight weeks.

In the face of increasing pressure for deliveries, the mills, by forcing production, have thus far succeeded in satisfying the current requirements of consumers. In fact, the chief effect of the consuming trade's concern about shipments has been a tendency to duplicate orders, thereby throwing mills still further behind in their rolling schedules.

A similar situation exists in semi-finished steel. Detached finishing mills generally have been attempting to add to their contracts for semi-finished material or to buy extra tonnage elsewhere, but, in the light of the price advance just announced, their tactics may have reflected buying strategy rather than an actual shortage of steel for rolling.

Specifying of finished steel may be further stimulated if mills adhere to March 15 as the closing date for releases against current contracts. Cold-finished bar mills and a number of sheet producers have announced their intention of setting such a deadline, but whether this practice will be followed for all products recently advanced is doubtful. Some mills, notably Eastern plate producers, have not insisted on a mid-month expiration date in the past.

The new quotations on sheets have not yet been tested, as buyers are in no haste to contract for second quarter. The advances on bars, shapes and plates, likewise, have not been established except in the Chicago district. Some business in cold-finished steel bars has also been taken at increased prices.

Tin mill black sheets, contrary to earlier reports, have not been advanced in price. The recent increase of $2 a ton in the base price of cold-rolled strip to 2.95c. a lb., Cleveland or Pittsburgh, has been abandoned as a result of the general adoption of a new card of extras, which will mean a net advance of fully that amount, averaging all specifications.

In contrast with the active finished products are such commodities as steel pipe. Furnace welded pipe mills are operating at only 50 or 55 per cent of capacity, while seamless tube mills are running at 70 to 75 per cent. Demand for standard pipe is undergoing a slow seasonal increase, but the call for welded oil country goods is very poor. A number of large pipe line projects are still before the trade, and the pending list has been augmented by a 73-mile gas line, which the Cities Service Co. will lay from Saginaw to Galloway, Mo. The Humble Oil Co. has placed a 130-mile line with a Youngstown mill.

Tin plate mills, following a decline in shipping orders, are running at 85 per cent of capacity, compared with a recent rate of 90 per cent.

Following a winter lull in fabricating awards, structural steel prospects are bright. New projects total 67,000 tons for the week and 122,000 tons for the past fortnight. Early action is expected on a San Francisco bridge, 25,000 tons, and a Baltimore causeway, 30,000 tons.

Railroad freight cars ordered number 3100, making a total of more than 27,000 bought by domestic roads since Jan. 1. The week's rail orders, including 2500 tons placed by the Cotton Belt, aggregate 26,000 tons.

Pig iron buyers are gradually manifesting more interest in second quarter requirements. At Cleveland sales totaled 53,000 tons and at Chicago 60,000 tons. Shipments are heavy, one northern Ohio maker reporting a gain of 25 per cent over the total for the first two months of 1928. Competition is keen, however, with some producers invading neutral territories or districts at a distance at the sacrifice of prices at furnace.

Scrap is marking time at Pittsburgh and Chicago, and is weaker at Philadelphia, where heavy melting steel has declined 50c. a ton to $16.

Two advances in copper in as many days bring the quotation Feb. 26 to 18.50c. a lb., delivered, for electrolytic, the highest price since September, 1920.

THE IRON AGE composite prices are unchanged, finished steel remaining at 2.391c. a lb. for the twelfth week and pig iron at $18.38 a gross ton for the fifth week.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics
At Date, One Week, One Month, and One Year Previous

Pig Iron, Per Gross Ton:	Feb. 26, 1929	Feb. 19, 1929	Jan. 29, 1929	Feb. 28, 1928
No. 2 foundry, Philadelphia	$21.26	$21.26	$21.26	$20.76
No. 2, Valley furnace	17.50	17.50	17.50	17.25
No. 2, Southern, Cin'ti	20.19	20.19	20.19	19.69
No. 2, Birmingham	16.50	16.50	16.50	16.00
No. 2 foundry, Chicago*	20.00	20.00	20.00	18.50
Basic, del'd eastern Pa	20.25	20.25	19.75	19.50
Basic, Valley furnace	17.50	17.50	17.50	17.00
Valley Bessemer, del'd P'gh	20.01	20.01	20.01	19.26
Malleable, Chicago*	20.00	20.00	20.00	18.50
Malleable, Valley	18.00	18.00	18.00	17.25
Gray forge, Pittsburgh	18.76	18.76	18.76	18.51
L. S. charcoal, Chicago	27.04	27.04	27.04	27.04
Ferromanganese, furnace	105.00	105.00	105.00	100.00
Rails, Billets, Etc., Per Gross Ton:				
O.-h. rails, heavy, at mill	$43.00	$43.00	$43.00	$43.00
Light rails at mill	36.00	36.00	36.00	36.00
Bess. billets, Pittsburgh	**34.00**	33.00	33.00	33.00
O.-h. billets, Pittsburgh	**34.00**	33.00	33.00	33.00
O.-h. sheet bars, P'gh	**35.00**	34.00	34.00	34.00
Forging billets, P'gh	**39.00**	38.00	38.00	38.00
O.-h. billets, Phila	**39.30**	38.30	38.30	38.30
Wire rods, Pittsburgh	42.00	42.00	42.00	44.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb	1.90	1.90	1.90	1.85
Finished Iron and Steel,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Iron bars, Philadelphia	2.12	2.12	2.12	2.12
Iron bars, Chicago	2.00	2.00	2.00	1.90
Steel bars, Pittsburgh	1.90	1.90	1.90	1.85
Steel bars, Chicago	**2.05**	2.00	2.00	1.95
Steel bars, New York	2.24	2.24	2.24	2.19
Tank plates, Pittsburgh	1.90	1.90	1.90	1.85
Tank plates, Chicago	**2.05**	2.00	2.00	1.95
Tank plates, New York	2.17½	2.17½	2.17½	2.17½
Beams, Pittsburgh	1.90	1.90	1.90	1.85
Beams, Chicago	**2.05**	2.00	2.00	1.95
Beams, New York	2.14½	2.14½	2.14½	2.14½
Steel hoops, Pittsburgh	2.10	2.10	2.10	2.20

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

Sheets, Nails and Wire,	Feb. 26, 1929	Feb. 19, 1929	Jan. 29, 1929	Feb. 28, 1928
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Sheets, black, No. 24, P'gh	2.85	2.85	2.85	2.90
Sheets, black, No. 24, Chicago dist. mill	2.95	2.95	2.95	3.00
Sheets, galv., No. 24, P'gh	3.60	3.60	3.60	3.65
Sheets, galv., No. 24, Chicago dist. mill	3.70	3.70	3.70	3.85
Sheets, blue, 9 & 10, P'gh	2.10	2.10	2.10	2.10
Sheets, blue, 9 & 10, Chicago dist. mill	2.20	2.20	2.20	2.20
Wire nails, Pittsburgh	2.65	2.65	2.65	2.65
Wire nails, Chicago dist. mill	2.70	2.70	2.70	2.70
Plain wire, Pittsburgh	2.50	2.50	2.50	2.50
Plain wire, Chicago dist. mill	2.55	2.55	2.55	2.55
Barbed wire, galv., Pittsburgh	3.30	3.30	3.30	3.35
Barbed wire, galv., Chicago dist. mill	3.35	3.35	3.35	3.40
Tin plate, 100 lb. box, P'gh	$5.35	$5.35	$5.35	$5.25
Old Material, Per Gross Ton:				
Heavy melting steel, P'gh	$18.50	$18.50	$19.25	$14.75
Heavy melting steel, Phila	*16.00*	16.50	17.50	13.50
Heavy melting steel, Ch'go	15.75	15.75	16.00	12.75
Carwheels, Chicago	14.50	14.50	14.50	14.00
Carwheels, Philadelphia	16.50	16.50	16.50	15.50
No. 1 cast, Pittsburgh	15.00	15.00	16.00	14.50
No. 1 cast, Philadelphia	16.50	16.50	16.50	16.00
No. 1 cast, Ch'go (net ton)	16.00	16.00	16.00	14.50
No. 1 RR. wrot., Phila	16.00	16.00	15.50	15.00
No. 1 RR. wrot., Ch'go (net)	14.00	14.00	14.25	11.00
Coke, Connellsville,				
Per Net Ton at Oven:				
Furnace coke, prompt	$3.00	$3.00	$2.75	$2.60
Foundry coke, prompt	3.75	3.75	3.75	3.75
Metals,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York	**18.37½**	*18.12½	17.12½	14.20
Electrolytic copper, refinery	**18.25**	17.75	16.75	13.75
Zinc, St. Louis	6.35	6.35	6.35	5.45
Zinc, New York	6.70	6.70	6.70	5.80
Lead, St. Louis	**6.90**	6.85	6.50	5.90
Lead, New York	6.95	6.95	6.65	6.15
Tin (Straits), New York	48.87½	49.25	48.75	51.75
Antimony (Asiatic), N. Y	9.37½	9.62½	9.62½	10.25

*Nominal.

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Pittsburgh

Semi-Finished Steel Advanced $1 a Ton—Some Products Extremely Active While Others Are Relatively Quiet

PITTSBURGH, Feb. 26.—The steel market divides itself into two categories. The first comprises finished products in which the mills have been somewhat behind in deliveries, while the second takes in those in which mills can make very prompt shipment. While all buyers of steel are theoretically committed to a strict policy of hand-to-mouth buying in keeping with absolutely known requirements, they are quick to depart from the policy when they observe any doubt as to their receiving deliveries on time, and, accordingly, there has been very free ordering in certain lines, whereby the mills involved are thrown still farther behind in deliveries. The divergence between the more active and the less active lines is thus accentuated, and, while from one viewpoint the steel market appears very busy, from another viewpoint it seems rather dull.

About a dozen independent sheet mills have advanced prices $2 per ton on blue annealed, black and galvanized sheets, but not on tin mill black sheets or automobile sheets. Effective Feb. 25, the American Sheet & Tin Plate Co. marked up its prices correspondingly. All the important sellers of semi-finished steel have advanced prices $1 a ton.

The rate of steel production in the Youngstown district has increased, with practically all the open-hearths in operation and Bessemer departments running at a moderate rate. The Pittsburgh and Wheeling districts are doing almost as well and the three districts combined are averaging close to 90 per cent in steel ingot output.

Pig Iron.—The pig iron market remains inactive, but prices are well maintained. A sale of several thousand tons of basic pig iron by a Valley merchant furnace is reported at the full $17.50 price, deliveries to begin in March, and another tonnage now pending is expected to go at the same figure. Foundry iron is moving only in small lots, on which $17.50 seems to be obtained without difficulty. Only small lots of Bessemer are being taken and these bring $18.25. Some producers get $18.25 also on malleable. There are well defined reports that Lake Superior iron ore may be advanced in price for the coming season. The last price change was for the season of 1925. Some furnacemen contend that the recent rise in scrap prices, the advance of 25c. on Connellsville coke and the probable advance on iron ore should bring about an advance in pig iron prices.

Prices per gross ton, f.o.b. Valley furnace:

Basic	$17.50
Bessemer	18.25
Gray forge	17.00
No. 2 foundry	17.50
No. 3 foundry	17.00
Malleable	$18.00 to 18.25
Low phos., copper free	26.50 to 27.00

Freight rate to Pittsburgh or Cleveland district, $1.76.

Semi-Finished Steel.—Youngstown Sheet & Tube, Republic, Jones & Laughlin, Corrigan-McKinney and Bethlehem are understood to have ad-

vanced prices $1 a ton, effective immediately, making their prices $34 on billets and slabs and $35 on sheet bars. The condition has grown more pronounced of various detached finishing mills seeking to place additional March tonnages on their contracts or trying to buy separate tonnages elsewhere, but in view of the price advance this may really represent a piece of buying strategy rather than an actual shortage of steel for immediate rolling.

Bars, Shapes and Plates.—Mills generally have followed the example of the Carnegie Steel Co. and have marked up their prices on bars, shapes and plates $1 a ton to 1.95c., applying alike to prompt and forward business, but there is very little business of either class going, since buyers are provided with contracts for the quarter, and they have no disposition to look farther ahead. Specifications are very heavy on bar contracts, mills having an average of about a month's production in actual shipping orders. The long standing dullness in plates is only slightly relieved by some recent buying, while shapes are not moving freely. Fabricated structural steel lettings have been relatively light in the last few months. The advance in asking prices on shapes and plates is largely nominal, while in bars the mills generally would quote the advanced price on prompt business and they profess assurance that they are going to secure it on second quarter contracts.

Rails and Track Supplies.—Mills have a very fair engagement in rolling standard-section rails on annual contracts, specifications against which have been coming in freely. Light rails remain decidedly dull.

Wire Products.—Nails are not moving from mills with particular freedom as jobbers loaded up to quite an extent in December and January, taking advantage of the old price. In plain wire, on the other hand, mills had limited their contracts and shipments at the advanced price have been fairly heavy since early in January. Current prices are to be asked on second quarter contracts.

Tubular Goods.—For a week past it has been reported that the large order for line pipe for a natural gas line from Monroe, La., to St. Louis had been divided among a Pittsburgh, a Youngstown and a Milwaukee producer, but the pipe mills state that as yet they have received no orders in this connection. The business is to be placed in New York by the Standard Oil Co. of New Jersey. Demand for standard pipe is undergoing a slow seasonal increase. It is fully equal to that at this date last year or the year before. Demand for welded oil country goods is very poor, while demand for seamless oil country goods is only moderately active. There is heavy demand for seamless mechanical tubing. Pipe mills are averaging an operation of 50 to 55 per cent, while seamless tube mills are at 70 to 75 per cent, some of them having practically full operation.

Tin Plate.—Some of the tin plate mills are not receiving specifications on contracts as heavily as they expected when early in the year they put nearly all their mills in operation, and there has been a slight toning down in production, average operation of the tin plate industry being not over 85 per cent, against the recent 90 per cent rate.

Sheets.—Effective Monday, Feb. 25, the American Sheet & Tin Plate Co. advanced its prices $2 a ton on blue annealed, black and galvanized sheets, following the action of independent producers in the last 10 days along the same line. The advanced quotations are 2.20c. on blue annealed, 2.95c. on black and 3.70c. on galvanized sheets. Mills which have not yet advanced are expected to do so within a short time. Tin mill black sheets and automobile sheets are not affected. As metal furniture stock is based upon the price for common black, it is being advanced, which makes a spread between it and automobile sheets, and it is intimated that something may be done with automobile sheets later. The sheet industry has a practically full operation, slackness being confined almost entirely to mills physically disabled or making only the common finishes. Demand for normalized sheets continues very heavy and apparently in excess of the finishing capacity. Last week the American Sheet & Tin Plate Co. received authorization to build two new normalizing furnaces, at Farrell and Gary, and these will be rushed to completion. Demand for blue annealed sheets is heavier, there being much car building and repair work. While some mills are complaining of light demand for galvanized sheets, others are faring well. Demand for automobile sheets remains very heavy.

Cold Finished Steel Bars and Shafting.—The advanced asking price of 2.30c. on cold finished bars, announced by various makers as effective Feb. 19, is not undergoing any crucial test as yet, since consumers are well covered. Specifications are heavy.

Hot-Rolled Flats.—Consumers of hot-rolled strips are more interested in securing deliveries on their existing contracts than in making engagements for next quarter, and so the recently announced advances to 2c. on 6-in. and under and 1.90c. on wider strips is not being tested in an important way. Mills generally are scheduled with actual shipping orders for more than a month.

Cold-Rolled Strips.—Local makers

Warehouse Prices, f.o.b. Pittsburgh

	Base per Lb.
Plates	3.00c.
Structural shapes	3.00c.
Soft steel bars and small shapes	2.90c.
Reinforcing steel bars	2.75c.
Cold-finished and screw stock—	
Rounds and hexagons	3.60c.
Squares and flats	4.10c.
Bands	3.25c.
Hoops	4.25c.
Black sheets (No. 24), 25 or more bundles	3.80c.
Galv. sheets (No. 24), 25 or more bundles	4.55c.
Blue ann'l'd sheets (No. 10), 1 to 10 sheets	3.45c.
Galv. corrug. sheets (No. 28), per square	$4.43
Spikes, large	3.40c.
Small	3.80c. to 5.25c.
Boat	3.80c.
Track bolts, all sizes, per 100 count,	60 per cent off list
Machine bolts, 100 count,	60 per cent off list
Carriage bolts, 100 count,	60 per cent off list
Nuts, all styles, 100 count,	60 per cent off list
Large rivets, base per 100 lb.	$3.50
Wire, black soft ann'l'd, base per 100 lb	$3.00 to 3.10
Wire, galv. soft, base per 100 lb.	3.00 to 3.10
Common wire nails, per keg	3.00
Cement coated nails, per keg	3.05

The Iron Age Composite Prices

Finished Steel

Feb. 26, 1929, 2.391c. a Lb.

One week ago	2.391c.
One month ago	2.391c.
One year ago	2.364c.
10-year pre-war average	1.689c.

Based on steel bars, beams, tank plates, wire, nails, black pipe and black sheets. These products make 87 per cent of the United States output of finished steel.

	High		Low	
1928	2.391c.,	Dec. 11;	2.314c.,	Jan. 3
1927	2.453c.,	Jan. 4;	2.293c.,	Oct. 25
1926	2.453c.,	Jan. 5;	2.403c.,	May 18
1925	2.560c.,	Jan. 6;	2.396c.,	Aug. 18
1924	2.789c.,	Jan. 15;	2.460c.,	Oct. 14
1923	2.824c.,	Apr. 24;	2.446c.,	Jan. 2

Pig Iron

Feb. 26, 1929, $18.38 a Gross Ton

One week ago	$18.38
One month ago	18.38
One year ago	17.75
10-year pre-war average	15.72

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

	High		Low	
1928	$18.59,	Nov. 27;	$17.04,	July 24
1927	19.71,	Jan. 4;	17.54,	Nov. 1
1926	21.54,	Jan. 5;	19.46,	July 13
1925	22.50,	Jan. 13;	18.96,	July 7
1924	22.88,	Feb. 26;	19.21,	Nov. 3
1923	30.86,	Mar. 20;	20.77,	Nov. 20

Mill Prices of Finished Iron and Steel Products

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill	1.90c. to 1.95c.
F.o.b. Chicago	2.05c. to 2.15c.
Del'd Philadelphia	2.22c. to 2.27c.
Del'd New York	2.24c. to 2.29c.
Del'd Cleveland	1.95c. to 1.97½c.
F.o.b. Cleveland	1.90c. to 2.00c.
F.o.b. Lackawanna	2.00c. to 2.10c.
F.o.b. Birmingham	2.15c. to 2.20c.
C.i.f. Pacific ports	2.35c.
F.o.b. San Francisco mills	2.35c. to 2.40c.

Billet Steel Reinforcing

F.o.b. Pittsburgh mills, 40, 50, 60-ft.	2.00c.
F.o.b. Pittsburgh mills, cut lengths	2.25c.
F.o.b. Birmingham, mill lengths	2.15c.

Rail Steel

F.o.b. mills east of Chicago dist.	1.85c.
F.o.b. Chicago Heights mill	1.95c.

Iron

Common iron, f.o.b. Chicago	2.00c. to 2.10c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.12c.
Common iron, del'd New York	2.14c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.90c. to 1.95c.
F.o.b. Chicago	2.05c. to 2.15c.
F.o.b. Birmingham	2.15c. to 2.20c.
Del'd Cleveland	2.09c. to 2.14c.
Del'd Philadelphia	2.10c. to 2.15c.
F.o.b. Coatesville	2.00c. to 2.10c.
F.o.b. Sparrows Point	2.00c. to 2.10c.
F.o.b. Lackawanna	2.00c. to 2.10c.
Del'd New York	2.17½c. to 2.27½c.
C.i.f. Pacific ports	2.20c. to 2.30c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.90c. to 1.95c.
F.o.b. Chicago	2.05c. to 2.15c.
F.o.b. Birmingham	2.15c. to 2.20c.
F.o.b. Lackawanna	2.00c. to 2.10c.
F.o.b. Bethlehem	2.00c. to 2.10c.
Del'd Cleveland	2.09c. to 2.14c.
Del'd Philadelphia	2.01c. to 2.06c.
Del'd New York	2.14½c. to 2.24½c.
C.i.f. Pacific ports	2.35c.

Hot-Rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, P'gh	1.90c. to 2.00c.
Wider than 6 in., P'gh	1.80c. to 1.90c.
6 in. and narrower, Chicago	2.10c. to 2.20c.
Wider than 6 in., Chicago	2.00c. to 2.10c.
Cooperage stock, P'gh	2.10c. to 2.20c.
Cooperage stock, Chicago	2.20c. to 2.30c.

Cold-Finished Steel

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	2.30c.
Bars, f.o.b. Chicago	2.30c.
Bars, Cleveland	2.35c.
Shafting, ground, f.o.b. mill	*2.55c. to 3.50c.
Strips, P'gh	2.85c.
Strips, Cleveland	2.85c.
Strips, del'd Chicago	3.15c.
Strips, Worcester	3.00c. to 3.10c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland	4.25c. to 4.35c.

*According to size.

Wire Products

(Carload lots, f.o.b. Pittsburgh and Cleveland, to jobbers and retailers.)

	Base per Keg
Wire nails	$2.65 to $2.75
Galvanized nails	4.65 to 4.75
Galvanized staples	3.35 to 3.45
Polished staples	3.10 to 3.20
Cement coated nails	2.65 to 2.75

	Base per 100 Lb.
Bright plain wire, No. 6 to No. 9 gage	$2.50 to $2.60
Annealed fence wire	2.65 to 2.75
Spring wire	3.50 to 3.60
Galv'd wire, No. 9	3.10 to 3.20
Barbed wire, galv'd	3.30 to 3.40
Barbed wire, painted	3.05 to 3.15
Woven wire fence (per net ton to retailers)	65.00

Chicago district mill and delivered Chicago prices are $1 per ton above the foregoing. Birmingham mill prices $3 a ton higher; Worcester Mass., (wire) mill $3 a ton higher on production of that plant; Duluth, Minn., mill $2 a ton higher; Anderson, Ind., $1 higher.

Cut Nails

	Per 100 Lb.
Carloads, Wheeling, Reading or Northumberland, Pa.	$2.70
Less carloads, Wheeling or Reading	2.80

Sheets

Blue Annealed

	Base per Lb.
Nos. 9 and 10 f.o.b. P'gh	2.10c. to 2.20c.
Nos. 9 and 10, f.o.b. Chicago dist.	2.20c. to 2.30c.
Nos. 9 and 10, del'd Cleveland	2.29c. to 2.39c.
Nos. 9 and 10, del'd Philadelphia	2.42c. to 2.52c.
Nos. 9 and 10, f.o.b. Birmingham	2.25c. to 2.35c.

Box Annealed, One Pass Cold Rolled

No. 24, f.o.b. Pittsburgh	2.85c. to 2.95c.
No. 24, f.o.b. Chicago dist. mill	2.95c. to 3.05c.
No. 24, del'd Cleveland	3.04c. to 3.14c.
No. 24, del'd Philadelphia	3.17c. to 3.27c.
No. 24, f.o.b. Birmingham	3.00c. to 3.10c.

Metal Furniture Sheets

No. 24, f.o.b. P'gh, No. 1 grade	4.00c. to 4.10c.
No. 24, f.o.b. P'gh, No. 2 grade	3.80c. to 3.90c.

Galvanized

No. 24, f.o.b. Pittsburgh	3.60c. to 3.70c.
No. 24 f.o.b. Chicago dist. mill	3.70c. to 3.80c.
No. 24, del'd Cleveland	3.79c. to 3.89c.
No. 24, del'd Philadelphia	3.92c. to 4.02c.
No. 24, f.o.b. Birmingham	3.75c. to 3.85c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	3.00c.
No. 28, f.o.b. Chicago dist. mill	3.10c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh	4.10c.

Long Ternes

No. 24, 8-lb. coating, f.o.b. mill	4.00c.

Vitreous Enameling Stock

No. 24, f.o.b. Pittsburgh	3.90c.

Tin Plate

	Per Base Box
Standard cokes, f.o.b. P'gh district mills	$5.35
Standard cokes, f.o.b. Gary	5.45

Terne Plate

(*F.o.b. Morgantown or Pittsburgh*)
(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$11.20
15-lb. coating I.C.	14.00
20-lb. coating I.C.	15.80
25-lb. coating I.C.	$16.70
30-lb. coating I.C.	17.75
40-lb. coating I.C.	19.85

Alloy Steel Bars

(F.o.b. maker's mill)

Alloy Quality Bar Base, 2.65c. to 2.75c. per Lb.

S.A.E. Series Numbers		Alloy Differential
2000	(½% Nickel)	$0.25
2100	(1½% Nickel)	0.55
2300	(3½% Nickel)	1.50
2500	(5% Nickel)	2.25
3100	Nickel Chromium	0.55
3200	Nickel Chromium	1.35
3300	Nickel Chromium	3.80
3400	Nickel Chromium	3.20
4100	Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100	Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600	Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel)	1.05
5100	Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100	Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100	Chromium Spring Steel	0.20
6100	Chromium Vanadium Bars	1.20
6100	Chromium Vanadium Spring Steel	0.95
9250	Silicon Manganese Spring Steel (flats)	0.25
	Rounds and squares	0.50
	Chromium Nickel Vanadium	1.50
	Carbon Vanadium	0.95

Above prices are for hot-rolled steel bars, forging quality. The ordinary differential for cold-drawn bars is ¾c. per lb. higher. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis. For billets under 4 x 4 down to and including 2½ in. squares, the price is $5 a gross ton above the 4 x 4 billet price.

Slabs with sectional area of 16 in. or over carry the billet price; slabs with sectional area of 12 in. to 16 in. carry a $5 extra above the billet price and slabs with a sectional area under 12 in. carry the bar price.

Band sizes are 40c. per 100 lb. higher.

Rails

	Per Gross Ton
Standard, f.o.b. mill	$43.00
Light (from billets), f.o.b. mill	36.00
Light (from rail steel), f.o.b. mill	34.00
Light (from billets), f.o.b. Ch'go mill	36.00

Track Equipment

	Base per 100 Lb.
Spikes, 9/16 in. and larger	$2.80
Spikes, ½ in. and smaller	2.80
Spikes, boat and barge	3.00
Tie plates, steel	2.15
Angle bars	$2.75
Track bolts, to steam railroads	$3.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count	70 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
⅛	45	19½	¼ and ⅜	+11	+36
¼ to ⅜	51	25½	½	23	5
½	56	42½	¾	28	11
¾	60	48½	1 and 1¼	31	15
1 to 3	62	50½	1½ and 2	35	18

Lap Weld

2	55	43½	2	23	9
2½ to 6	59	47½	2½ to 3½	28	13
7 and 8	56	43½	4 to 6	30	17
9 and 10	54	42½	7 and 8	29	16
11 and 12	53	40½	9 to 12	26	11

Butt Weld, extra strong, plain ends

⅛	41	24½	¼ and ⅜	+13	+48
¼ to ⅜	47	30½	½	23	7
½	53	42½	¾	28	12
¾	58	47½	1 to 2	34	18
1 to 1½	60	49½			
2 to 3	61	50½			

Lap Weld, extra strong, plain ends

2	53	42½	2	29	13
2½ to 4	57	46½	2½ to 4	34	20
4½ to 6	56	45½	4½ to 6	33	19
7 to 8	52	39½	7 and 8	31	17
9 and 10	45	32½	9 to 12	21	8
11 and 12	44	31½			

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discount of 5%, and on galvanized by 1½ points, with supplementary discount of 5%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discounts of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2¼ in.	40	1½ in.	1
2½ in.—2¾ in.	48	1¾ in.	8
3 in.	54	2 in.—2¼ in.	13
3¼ in.—3¾ in.	56	2½ in.—2¾ in.	16
4 in.	59	3 in.	17
4½ in. to 6 in.	48	3¼ in. to 3½ in.	18
		4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold Drawn

1 in.	63	3 in.	48
1¼ to 1½ in.	55	3¼ to 3½ in.	50
1¾ in.	39	4 in.	53
2 to 2¼ in.	34	4½, 5 and 6 in.	42
2½ to 2¾ in.	42		

Hot Rolled

2 and 2¼ in.	40	3¼ to 3½ in.	56
2½ and 2¾ in.	48	4 in.	59
3 in.	54	4½, 5 and 6 in.	48

Beyond the above base discounts a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb. base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gage take mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30%, base (carloads)	55
Carbon, 0.30% to 0.40%, base	50

Plus differentials for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

of cold-rolled strips have adopted the recently suggested revision of the card of extras and are having the list printed for issuance to the trade. Some of the extreme widths are reduced by from $3 to $9 a ton, but most of the changes from the old list are advances. On the average of all specifications, the net increase appears to be more than $2 a ton, and accordingly the mills have abandoned their recent position of advancing the base price from 2.85c. to 2.95c., so that the asking price on the new card will be 2.85c., base. Mills are well specified for four weeks or more.

Coal and Coke.—At last week's hearings before the United States Supreme Court on the appeal from the injunction against the Interstate Commerce Commission's ruling which fixed 45c. as the Lake coal freight differential between Pittsburgh and southern West Virginia, it developed that the railroads had compromised on 35c., which raised a question whether there was a real issue, and the court directed the opposing parties to file supplementary briefs on this point, giving them until yesterday. Pittsburgh and Connellsville shippers are dissatisfied with the way matters have been going in this case. The coal market is a shade easier and has little chance of strengthening with the season for domestic coal nearing its end. A number of contracts for gas slack for the new coal year, beginning April 1, have been closed at $1 to $1.10 and inquiry has lately appeared for steam slack, which in the spot market is 70c. to 75c. Connellsville furnace coke for spot shipment appears as strong as a week ago, offerings being very light, but demand also has been light. Single carloads bring $3.10, but the market is no more than $3 on blast furnace sized lots. Demand for heating coke is heavy, but is tapering off, and there have been some suspensions of shipments. Demand for spot foundry coke is slightly improved.

Old Material.—The scrap market has continued to mark time. Mills are operating at high rates, with prospects of sustained production for at least a few weeks, but are pursuing a hand-to-mouth policy in the matter of buying. No sales of heavy melting steel to mills are reported in the week, but a substantial volume of buying within the near future can hardly be avoided.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$18.00 to $19.00
No. 2 heavy melting steel	16.50 to 17.00
Scrap rails	17.75 to 18.25
Compressed sheet steel	18.00 to 18.50
Bundled sheets, sides and ends	16.50 to 17.00
Cast iron carwheels	15.00 to 15.50
Sheet bar crops, ordinary	18.50 to 19.00
Heavy breakable cast	13.00 to 13.50
No. 2 railroad wrought	18.50 to 19.00
Hvy. steel axle turnings	16.50 to 17.00
Machine shop turnings	11.50 to 11.75
Acid Open-Hearth Grades:	
Railr. knuckles and couplers	20.00 to 20.50
Railr. coil and leaf springs	20.00 to 20.50
Rolled steel wheels	20.00 to 20.50
Low phos. billet and bloom ends	22.00 to 22.50
Low phos., mill plates	20.50 to 21.00
Low phos., light grades	19.50 to 20.00
Low phos., sheet bar crops	20.50 to 21.00
Heavy steel axle turnings	16.50 to 17.00
Electric Furnace Grades:	
Low phos. punchings	19.50 to 20.00
Hvy. steel axle turnings	16.50 to 17.00
Blast Furnace Grades:	
Short shoveling steel turnings	12.50 to 13.00
Short mixed borings and turnings	12.50 to 13.00
Cast iron borings	12.50 to 13.00
Rolling Mill Grades:	
Steel car axles	21.00 to 22.00
No. 1 railroad wrought	14.50 to 15.00
Sheet bar crops	20.50 to 21.00
Cupola Grades:	
No. 1 cast	15.00 to 15.50
Rails 3 ft. and under	19.50 to 20.00

Iron Ore Production of the World

PRODUCTION of iron ore in the world in 1927 was approximately 170,000,000 metric tons, of which the United States accounted for 62,732,045 tons, or about 37 per cent. France was the second producer, with 45,670,920 metric tons, followed by Great Britain with 11,386,467 tons and Sweden with 9,660,977 tons. These figures and those in the table are taken from a publication of the United States Bureau of Mines and were compiled by Hubert W. Davis of that bureau. In the case of a few countries for which 1927 figures were not available their totals have been estimated as the same as for the preceding year, or the latest year for which figures are available.

It is noteworthy that, whereas the United States registered a decline of 6,000,000 tons from 1926, France showed a gain of more than that amount. So did Great Britain, owing to her recovery from the coal and general strikes of 1926. Other countries, aside from the three named, made gains aggregating about 7,500,000 tons.

IRON ORE PRODUCTION OF VARIOUS COUNTRIES IN 1926 AND 1927

	1927 Metric Tons	Per Cent	1926 Metric Tons	Per Cent
United States	62,732,045	36.9	68,708,349	44.3
Chile	1,516,440	...	1,476,355	...
Newfoundland	1,356,851	...	879,603	...
Cuba	421,505	...	587,369	...
Other America	127,000(a)	...	127,000(a)	...
France	45,670,920	26.9	39,480,400	25.4
Great Britain	11,386,467	6.7	4,160,101	2.7
Sweden	9,660,977	5.7	8,465,914	5.5
Luxemburg	7,266,249	4.3	7,756,240	5.0
Germany	6,004,836	3.5	4,594,987	2.95
Spain	4,960,394	2.9	3,181,589	2.1
Russia	4,816,703	2.8	3,415,278	2.2
Austria	1,598,570	...	1,094,372	...
Czechoslovakia	1,421,000(b)	...	1,421,174	...
Other Europe	2,248,000(a)	...	1,958,000(a)	...
Algeria	2,004,189	1.2	1,629,425	1.05
British India	1,686,000(b)	1.0	1,685,927	1.1
China	1,519,000(b)	...	1,519,000(b)	...
Australia	917,526	...	757,385	...
Tunisia	915,000	...	582,000	...
Morocco (Spanish)	800,000(b)	...	800,000(b)	...
Other countries	1,050,000(a)	...	890,000(a)	...
Total	170,080,000(c)		155,170,000(c)	

(a) Partly estimated. (b) Estimated. (c) Approximately.

Exposition to Cover Oil Heating Progress

An exposition to depict the rapid development of the oil heating industry and modern oil equipment will be one of the features of the sixth annual convention of the American Oil Burner Association to be held in the Hotel Pennsylvania in New York, April 9, 10 and 11.

Included in the list of speakers for the convention are Elliott Harrington, industrial engineering department, General Electric Co., who will speak on "The Part Electricity Plays in the Operation of Domestic Oil Burners," and Borden and Busse, professors of New York University, who are scheduled to discuss "This Business of Selling."

Government Wants Engineers

Open competitive examinations are announced by the United States Civil Service Commission for materials testing engineer, at entrance salary of $3,800 a year, and associate materials testing engineers, at $3,200 and $2,600 a year. Applications must be on file with the Civil Service Commission at Washington not later than March 27. Full information may be obtained from the Civil Service Commission, Washington, or the Board of Examiners at the post office or custom house in any city.

The New York and Philadelphia offices of the Cohoes Rolling Mill Co., Cohoes, N. Y., manufacturer of wrought iron pipe, will be consolidated at New York on March 1, under the management of William R. Mittleman. The company's New York office is located at 50 Church Street.

A new General Electric control device is the CR-2960-SY-105, a small, inexpensive, oil-immersed switch for use in throwing small alternating or direct-current motors across the line.

Semi-Finished Steel, Raw Materials, Bolts and Rivets

Mill Prices of Semi-Finished Steel

Billets and Blooms

	Per Gross Ton
Rerolling, 4 in. and under 10 in., Pittsburgh	$34.00
Rerolling, 4 in. and under 10 in., Youngstown	34.00
Rerolling, 4 in. and under 10 in., Cleveland	35.00
Rerolling, 4 in. and under 10 in., Chicago	35.00
Forging quality, Pittsburgh	39.00

Sheet Bars

(Open hearth or Bessemer)

	Per Gross Ton
Pittsburgh	$35.00
Youngstown	35.00
Cleveland	35.00

Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

	Per Gross Ton
Pittsburgh	$34.00
Youngstown	34.00
Cleveland	34.00

Skelp

(F.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.90c. to 1.95c.
Universal	1.90c. to 1.95c.
Sheared	1.90c. to 1.95c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$42.00
Cleveland	42.00
Chicago	43.00

Prices of Raw Material

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	$4.55
Old range non-Bessemer, 51.50% iron	4.40
Mesabi Bessemer, 51.50% iron	4.40
Mesabi non-Bessemer, 51.50% iron	4.25
High phosphorus, 51.50% iron	4.15

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Algerian	10.00c.
Iron ore, low phos., Swedish, average 68% iron	10.00c.
Iron ore, basic Swedish, average 65% iron	9.00c.
Manganese ore, washed, 52% manganese, from the Caucasus	33.00c. to 35.00c.
Manganese ore, Brazilian, African or Indian, basic 50%	33.00c. to 35.00c.
Tungsten ore, high grade, per unit, in 60% concentrates	$11.75 to $12.00

	Per Gross Ton
Chrome ore, 45 to 50% Cr_2O_3, crude, c.i.f. Atlantic seaboard	$22.00 to $24.00

	Per Lb.
Molybdenum ore, 85% concentrates of MoS_2, delivered	50c. to 55c.

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville prompt	$3.00
Foundry, f.o.b. Connellsville prompt	$3.50 to 4.85
Foundry, by-product, Ch'go ovens	8.00
Foundry, by-product, New England, del'd	11.00
Foundry, by-product, Newark or Jersey City, delivered	9.00 to 9.40
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry by-prod., del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.25 to $1.75
Mine run coking coal, f.o.b. W. Pa. mines	1.50 to 1.75
Gas coal, ¾-in., f.o.b. Pa. mines	1.90 to 2.00
Mine run gas coal, f.o.b. Pa. mines	1.65 to 1.75
Steam slack, f.o.b. W. Pa. mines	70c. to 75c.
Gas slack, f.o.b. W. Pa. mines	1.00 to 1.10

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard	$105.00
Foreign, 80%, Atlantic or Gulf port, duty paid	105.00

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$31.00 to $34.00
Domestic, 16 to 19%	29.00 to 32.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50%	$83.50
75%	130.00

	Per Gross Ton Furnace		*Per Gross Ton Furnace*
10%	$35.00	12%	$39.00
11%	37.00	14 to 16%	45.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		*Per Gross Ton*
10%	$31.00	12%	$35.00
11%	33.00		

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		*Per Gross Ton*
6%	$24.00	10%	$29.00
7%	25.00	11%	31.00
8%	26.00	12%	33.00
9%	27.00		

Other Ferroalloys

Ferrotungsten, per lb., contained metal del'd	98c. to $1.05
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	11.00c.
Ferrovanadium, per lb. contained vanadium, f.o.b. furnace	$3.15 to $3.65
Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	$160.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton	$91.00
Ferrophosphorus, electric 24%, f.o.b. Anniston, Ala., per gross ton	$122.50

Fluxes and Refractories

Fluorspar

	Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silica, gravel, f.o.b. Illinois and Kentucky mines	$18.00
No. 2 lump, Illinois and Kentucky mines	20.00
Foreign, 85% calcium fluoride, not over 5% silica, c.i.f. Atlantic port, duty paid	$18.00 to 19.00
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silica, f.o.b. Illinois and Kentucky mines	32.50

Fire Clay Brick

	Per 1000 f.o.b. Works	
	High-Heat Duty Brick	Intermediate Heat Duty Brick
Pennsylvania	$43.00 to $46.00	$35.00 to $38.00
Maryland	43.00 to 46.00	35.00 to 38.00
New Jersey	50.00 to 65.00	.....
Ohio	43.00 to 46.00	35.00 to 38.00
Kentucky	43.00 to 46.00	35.00 to 38.00
Missouri	43.00 to 46.00	35.00 to 38.00
Illinois	43.00 to 46.00	35.00 to 38.00
Ground fire clay, per ton	7.00	

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$43.00
Chicago	52.00
Birmingham	50.00
Silica clay, per ton	$8.50 to 10.00

Magnesite Brick

	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Standard size	45.00

Chrome Brick

	Per Net Ton
Standard size	$45.00

Mill Prices of Bolts, Nuts, Rivets and Set Screws

Bolts and Nuts

Per 100 Pieces

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
†Machine bolts	70
†Carriage bolts	70
Lag bolts	70
Plow bolts, Nos. 1, 2, 3 and 7 heads	70
Hot-pressed nuts, blank or tapped, square	70
Hot-pressed nuts, blank or tapped, hexagons	70
C.p.c. and t. square or hex. nuts, blank or tapped	70
Washers*	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.

†Bolts with rolled thread up to and including ¼ in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

	Per Cent Off List
Semi-finished hexagon nuts	70
Semi-finished hexagon castellated nuts, S.A.E.	70
Stove bolts in packages, Pittsburgh	80, 10 and 5
Stove bolts in packages, Chicago	75, 20, 10 and 5
Stove bolts in packages, Cleveland	75, 20, 10 and 5
Stove bolts in bulk, Pittsburgh	80, 10, 5 and 2½
Stove bolts in bulk, Chicago	75, 20, 10, 5 and 2½
Stove bolts in bulk, Cleveland	75, 20, 10, 5 and 2½
Tire bolts	60, 5 and 5

Discounts of 70 per cent off on bolts and nuts applied on carload business. For less than carload orders discounts of 55 to 60 per cent apply.

Large Rivets

(½-In. and Larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$2.90 to $3.10
F.o.b. Chicago	3.00 to 3.20

Small Rivets

(½-In. and Smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70 and 10
F.o.b. Cleveland	70 and 10
F.o.b. Chicago	70 and 10

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws	80, 10 and 5
Milled standard set screws, case hardened	80 and 5
Milled headless set screws, cut thread	75 and 10
Upset hex. head cap screws, U.S.S. thread	85
Upset hex. cap screws, S.A.E. thread	85
Upset set screws	80, 10 and 5
Milled studs	70

Chicago

Mills Operating at 95 Per Cent—29 of 36 Steel Company Blast Furnaces On—Pig Iron Sales 60,000 Tons

CHICAGO, Feb. 26.—Ingot output in the Chicago district now stands at 95 per cent of capacity, following heavy releases for most finished and semi-finished grades of steel. The leading producer has lighted two blast furnaces, one at Gary and one at South Chicago, bringing the total number of steel mill furnaces now in blast to 29 out of 36 in the district.

Sales during the week were the second largest so far this year and mill books now extend well into the second quarter. Accurate data are not available, but it is the general belief that February shipments may establish a record for the second month of the year. Prices of plates, shapes and bars are crystallizing at $1 a ton advance named a week ago. The character of business, however, is such that 2.05c. to 2.10c. per lb. will govern on most purchases.

Users, having gained more confidence in the general business situation and finding mill deliveries less favorable, especially on small lots, are diverting to warehouses much of the business on which mills quote 2.15c. per lb. Second quarter books have been opened on practically all steel mill products. Forward buying, though under way in most commodities, has not assumed large proportions except in the heavy tonnage products.

Cold-rolled strip producers are naming 2.85c. per lb., Cleveland, as the second quarter base price to be used with the new card of extras. Sheet prices are advanced $2 a ton and second quarter books have been opened.

Pig Iron.—Sales of Northern foundry iron are active, and the total for the week is not less than 60,000 tons. Buying for the most part is quiet and steady. It is estimated that about 75 per cent of users' second quarter requirements are covered. This is considered significant, as sellers have found that four times out of five not more than half of the second quarter tonnage is on books by April 1. Prices are firm at $20, base, f.o.b. local furnace. Shipments remain at the high level reached several weeks ago.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75 to 2.25	$20.00
N'th'n No. 1 fdy., sil. 2.25 to 2.75	20.50
Malleable, not over 2.25 sil	20.00
High phosphorus	20.00
Lake Super. charcoal, sil. 1.50	27.04
So'th'n No. 2 fdy. (all rail)	$22.51 to 23.01
Low phos., sil. 1 to 2, copper free	29.50
Silvery, sil. 8 per cent	30.79
Bess. ferrosilicon, 14-15 per cent	46.29

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

Ferroalloys.—This market is quiet in new sales. Specifications remain large for all commodities.

Prices delivered Chicago: 80 per cent ferromanganese, $112.56; 50 per cent ferrosilicon, $83.50 to $88.50; spiegeleisen, 19 to 21 per cent, $40.76.

Plates.—The Chicago plate market remains active both in sales and specifications. Recent advances in prices and extended deliveries are inducing users to issue heavier specifications. Releases for plates that will be made into pipe are heavy and purchasers in the oil fields are taking large quantities. Two contracts for oil storage tanks to be erected in the West call for 3100 tons of steel and not less than 15,000 tons of similar work for delivery in Texas and on the Pacific Coast is now before the trade. It is reported here that headway is being made on the proposed gas line to St. Louis. This project is said to call for more than 100,000 tons of pipe. Denver, Colo., has decided to use reinforced concrete water pipe, and therefore will not make use of the 12,000 tons of steel which was indicated by the inquiry which came out early last fall. The Cities Service Co. has been granted permission by the Missouri Public Service Commission to construct a 73-mile gas line from Saginaw, Mo., to Galloway, Mo. Local steel producers estimate active railroad car inquiries in this market at 8000 units. According to their figures, 18,000 of the 25,000 cars placed so far this year will be fabricated in Western shops. Specifications from car builders are a trifle heavier, but releases are still light in view of the number of cars that have been purchased. Deliveries on plates range from four to eight weeks on most sizes.

Mill prices on plates, per lb.: 2.05c. to 2.15c. base, Chicago.

Structural Material.—Demand for structural material is expanding slowly in Chicago and in the Northwest, but business is reported unusually dull in central and southern Indiana. Local awards, while not of large aggregate tonnage, have been in sufficient volume to hold shop operations at a fair winter rate. Competition appears to be less keen and fabricators are realizing better prices than at the turn of the year. Awards for the week total more than 5000 tons and fresh inquiry is for 12,000 tons, of which 10,000 tons is for a gold mining company in Canada. Bids will be opened March 1 at Milwaukee on the 12,000 tons needed for a court house. Considerable interest is being shown locally in the prospect for an early award of the 6000 tons of steel required for the Damon Avenue bridge. Sellers of shapes are holding to 2.05c. to 2.15c. per lb., Chicago, on all quotations for new business. A few quotations are still out at old price levels and the trade is inclined to leave them undisturbed for the time being.

Mill prices on plain material, per lb.: 2.05c. to 2.15c. base, Chicago.

Bars.—Heavy specifications for mild steel bars continue to push deliveries into the future. A few sizes can now be had in four weeks, while eight weeks is the best promise on others. Producers have opened second quarter books at 2.05c. to 2.15c., Chicago. Sales in the week are large, and, in view of the fact that the best delivery that can be had is about April 1, the bulk of going tonnage is for shipment after that date. February shipments are unusually heavy, and they are larger by a wide margin than in the second month of last year. Buyers are still paying 1.95c., Chicago Heights, for rail steel bars. Current sales are in fair volume. Specifications are fully equal to production, which is on a double turn basis at the three mills in this district. Deliveries are less favorable, the average being about three weeks. Inclement weather is assigned as the cause for a sluggish movement of steel fence posts.

Wire Products.—Sellers have opened second quarter books at present prices. New purchases are small in total volume. Little importance is attached to this by producers, who still have sizable tonnages on their books and who look for sales to mount as the second quarter draws nearer. Specifications show some improvement, though not enough to bring February shipments in line with those in the second month in 1928. Specifications are not equal to production, which stands at about 70 per cent of capacity. As a result, mill stocks continue to expand, a condition which is desired by sellers, who look forward to an active spring demand. Salesmen are considerably handicapped by snow and ice-covered roads. Likewise, jobbers find distribution difficult. Farmers are little inclined to purchase their needs until the weather conditions improve. Jobbers in the South report a more active demand and some improvement is noted in the Middle West. Shipments to the manufacturing trade are steady.

Rails and Track Supplies.—Miscellaneous orders for rails total 26,000 tons, including 2500 tons ordered by the St. Louis Southwestern from the Inland Steel Co. Light rails are inactive, with total sales amounting only to several carloads. Purchases of track accessories total 6000 tons. Fresh inquiry is light. Local producers are operating nearly at capacity.

Prices f.o.b. mill, per gross ton: Standard section open-hearth and Bess. rails, $43; light rails, rolled from billets, $36. *Per lb.:* Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 2.15c.; angle bars, 2.75c.

Cast Iron Pipe.—This market continues to gain momentum, though many buyers are still waiting for winter weather to moderate before stating their requirements for spring pipe-laying programs. Among fresh inquiries are 1000 tons for South Bend, Ind.; 500 tons of 6-in. to 24-in. pipe for Rockford, Ill.; 800 tons for Dearborn, Mich., and 220 tons of 6-in. and 8-in. pipe for Jackson, Mich. Releases are heavier and foundries are

swinging into larger production. Deliveries are prompt on many sizes.

Prices per net ton, deliv'd Chicago: Water pipe, 6-in. and over, $45.20 to $46.20; 4-in., $49.20 to $50.20; Class A and gas pipe, $3 extra.

Sheets.—Chicago producers are announcing advances of $2 a ton, effective for current business and for second quarter contracts. Chicago delivered prices now are 2.25c. to 2.35c. per lb. for blue annealed sheets, 3.75c. to 3.85c. for galvanized and 3c. to 3.10c. for black sheets. Specifications are larger and hot mill schedules are more satisfactorily arranged, with output at 80 per cent of capacity.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 3.00c. to 3.10c.; No. 24 galv., 3.75c. to 3.85c.; No. 10 blue ann'l'd, 2.25c. to 2.35c. Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

Cold-Rolled Strip.—Although the new card of extras has not been universally adopted, sentiment is in favor of it and it seems probable that all sellers in this district will be making use of it in the near future. Consideration is also being given to the second quarter base price. Some producers are known to be in favor of placing it at 2.85c. per lb., Cleveland, or 3.15c., delivered Chicago. Current specifications show some improvement, but shipments in the first two months of this year do not match with the total volume in January and February, 1928.

Old Material.—The local scrap market is more stable than in recent weeks. Although there are some dealers who are not anxious to sell, there are those who feel that prices will recede with the heavy spring movement of scrap and that this is the time to sell for long-time deliveries. Shipments of most grades are comparatively light, though there is promise now, as winter breaks, that incoming scrap will be in larger quantities. Many producers are having trouble in getting cars to load, and snowbound switching yards, especially in the North and Northwest, are contributing to delays in transit. Active unsolicited inquiry is reported in foundry grades, with the exception of malleable scrap, which has been accumulated by users in recent weeks. Heavy melting steel is steady at $16.25 per gross ton, delivered. The St. Paul will sell 5000 tons. The Muncie, Ind., plant of the General Motors Corporation is offering 18 cars of borings, and Chevrolet will sell 75 cars of borings, 35 cars of machine shop turnings and 40 cars of hydraulic bundles.

Prices deliv'd Chicago district consumers:

Per Gross Ton

Basic Open-Hearth Grades:	
Heavy melting steel	$15.75 to $16.25
Shoveling steel	15.75 to 16.25
Frogs, switches and guards, cut apart, and misc. rails	16.75 to 17.25
Hydraul. compressed sheets	14.25 to 14.75
Drop forge flashings	12.00 to 13.00
Forg'd cast and r'l'd steel carwheels	19.00 to 19.50
Rail'd tires, charg. box size	19.00 to 19.50
Railr'd leaf spring cut apart	19.00 to 19.50
Acid Open-Hearth Grades:	
Steel couplers and knuckles	17.00 to 17.50
Coil springs	19.50 to 20.00
Electric Furnace Grades:	
Axle turnings	15.75 to 16.25
Low phos. punchings	17.50 to 18.00
Low phos. plate, 12 in. and under	17.50 to 18.00
Blast Furnace Grades:	
Axle turnings	12.75 to 13.25
Cast iron borings	11.50 to 12.00
Short shoveling turnings	11.50 to 12.00
Machine shop turnings	8.50 to 9.00
Rolling Mill Grades:	
Iron rails	16.00 to 16.50
Rerolling rails	17.50 to 18.00
Cupola Grades:	
Steel rails less than 3 ft.	18.75 to 19.25
Steel rails less than 2 ft.	19.75 to 20.25
Angle bars, steel	17.00 to 17.50
Cast iron carwheels	14.50 to 15.00
Malleable Grades:	
Railroad	19.00 to 19.50
Agricultural	16.50 to 17.00
Miscellaneous:	
*Relaying rails, 56 to 60 lb.	23.00 to 25.00
*Relaying rails, 65 lb. and heav.	26.00 to 31.00

Per Net Ton

Rolling Mill Grades:	
Iron angles and splice bars	15.00 to 15.50
Iron arch bars and transoms	21.25 to 21.75
Iron car axles	27.50 to 28.00
Steel car axles	17.50 to 18.00
No. 1 railroad wrought	14.00 to 14.50
No. 2 railroad wrought	14.00 to 14.50
No. 1 busheling	12.00 to 12.50
No. 2 busheling	7.00 to 7.50
Locomotive tires, smooth	14.50 to 15.00
Pipes and flues	9.50 to 10.00
Cupola Grades:	
No. 1 machinery cast	16.00 to 16.50
No. 1 railroad cast	15.50 to 16.00
No. 1 agricultural cast	14.50 to 15.00
Stove plate	12.75 to 13.25
Grate bars	13.50 to 14.00
Brake shoes	12.50 to 13.00

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

Reinforcing Bars.—Awards are quite impressive in total volume, although individual orders are small. Shop operations continue low, being held in check by slow deliveries, caused by severe weather. Estimating bureaus are busy and architects report a satisfactory volume of work on hand. An expression often heard here, however, is that building operations will be less active this spring than in the early months of 1928. Road builders who bought large tonnages last fall are preparing for spring construction programs and and they expect to enter specifications at an early date. Prices show greater strength at 2.35c. per lb. for carloads of mild steel reinforcing bars out of Chicago warehouses, and 2.05c. a lb. for rail steel bars.

Bolts, Nuts and Rivets.—Sellers are preparing second quarter contracts which will be offered to the trade early in March. The general impression is that prices will remain as on previous contracts except for large rivets, which were advanced several weeks ago. Current specifications compare favorably with those of February last year, but they are a trifle under the January rate this year. Output holds steady between 65 and 70 per cent of capacity, and at this rate producers are able to build stocks, since shipments do not quite balance production.

Coke.—This market is firm and shipments are at the capacity of local ovens. Less trouble is being experienced in obtaining cars for loading.

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes	3.10c.
Soft steel bars	3.00c.
Reinforc'g bars, billet steel	2.35c.
Reinforc'g bars, rail steel	2.05c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons	3.60c.
Flats and squares	4.10c.
Bands (⅞ in. in Nos. 10 and 12 gages)	3.20c.
Hoops (No. 14 gage and lighter)	3.75c.
Black sheets (No. 24)	3.80c.
Galv. sheets (No. 24)	4.65c.
Blue ann'l'd sheets (No. 10)	3.35c.
Spikes, stand. railroad	3.55c.
Track bolts	4.55c.
Rivets, structural	3.60c.
Rivets, boiler	3.60c.
	Per Cent Off List
Machine bolts	60
Carriage bolts	60
Coach or lag screws	60
Hot-pressed nuts, sq., tap. or blank	60
Hot-pressed nuts, hex., tap. or blank	60
No. 8 black ann'l'd wire, per 100 lb.	$3.30
Com. wire nails, base per keg	3.20
Cement c't'd nails, base per keg	3.20

Calgary Growing as Iron and Steel Center

WASHINGTON, Feb. 26.—The growing importance of Calgary as an iron and steel center is seen in the announcement of the intention of the Dominion Wheel & Foundries, Ltd., of Toronto and Winnipeg, to set up a producing plant and warehouse in Calgary, says a report received from Trade Commissioner J. Bartlett Richards, Winnipeg. This company in its other plants manufactures chilled steel car wheels and heavy-duty castings. Recent announcements were made by the Manitoba Rolling Mills, Ltd., Winnipeg, and the Dominion Bridge Co., Ltd., which took over the existing Calgary firm, the Riverside Iron Works, of plans to build plants in Calgary.

To Employ Negro Foundrymen When Vouched For

A unique experiment in attempting to stabilize the confidence of employers of negro labor in Milwaukee has been undertaken by the Milwaukee Urban League, a negro welfare organization, by agreement with two foundries employing large numbers of colored workingmen. These shops will hire only those applicants who have the recommendation of the league that they are reliable workmen and steady on the job. William V. Kelley, secretary of the league, said that the experiment is the result of complaints from employers about the instability of negro labor. It appears that in recent weeks an unusually large number of negroes have come to Milwaukee from Chicago, following a "cleanup" campaign, and have sought work, remaining for only brief periods and then drifting elsewhere.

Philadelphia

New Steel Prices Untested—Sheet Mills Quote Extended Deliveries—Scrap Continues to Decline

PHILADELPHIA, Feb. 26.—The advance of $1 a ton on steel bars and plates has been generally adopted for current and second quarter delivery and some mills are quoting $1 a ton more on shapes. As the advance in prices was made without preliminary announcement to permit customers to cover future requirements, there has been practically no test of the new prices, and few consumers are covered for second quarter. Sheet producers are heavily engaged and in most cases are offering deliveries of four to six weeks. Some mills have advanced black and galvanized sheet prices $2 a ton for second quarter and others are expected to follow. When buying for the next quarter develops, the new price level on sheets may encounter a rather severe test, as consumers are in many instances receiving deliveries of black and galvanized sheets at $1 and $2 a ton under the recent level, so that they will be asked to pay $3 and $4 a ton more than their current contracts.

Pig Iron.—While $21 per ton, furnace, is being maintained on most of the small tonnages of foundry iron placed, concessions of 50c. a ton are not uncommon on desirable business, especially when competition from Buffalo sellers is encountered. There is a fair volume of inquiry for small lots, but only a small tonnage of second quarter business has been placed. The Baldwin Locomotive Works, Eddystone, Pa., is inquiring for 1500 tons of cylinder iron for the next quarter. Consumers are accepting regular deliveries on their contracts and in some instances are pressing for earlier deliveries than originally specified. Basic iron is quiet, following the purchase of three lots by eastern Pennsylvania consumers at about $20.50 per ton, delivered. Low phosphorus prices are firm. The Lorain Steel Co., Johnstown, Pa., is in the market for 2000 tons of copper bearing low phosphorus for second quarter delivery.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.	$21.26 to $21.76
East. Pa. No. 2X, 2.25 to 2.75 sil.	21.76 to 22.26
East. Pa. No. 1X	22.26 to 22.76
Basic (del'd east. Pa.)	20.25 to 20.50
Gray forge	20.50 to 21.00
Malleable	21.25 to 21.75
Stand. low phos. (f.o.b. N. Y. State furnace)	22.00 to 23.00
Cop. b'r'g low phos. f.o.b. furnace)	23.50 to 24.00
Va. No. 2 plain, 1.75 to 2.25 sil.	25.29
Va. No. 2X, 2.25 to 2.75 sil.	25.79

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to $1.64 from eastern Pennsylvania furnaces; $4.54 from Virginia furnaces.

Billets.—Billets have been advanced $1 a ton to $34, Pittsburgh, for rerolling grade and to $39 per ton, Pittsburgh, for forging quality.

Bars.—Mills are usually offering no better than three to four weeks delivery, and are quoting 1.95c., Pittsburgh, or 2.27c., Philadelphia, an advance of $1 a ton for second quarter contracts. Demand continues active and well distributed among various classes of consumers.

Shapes.—Although an advance of $1 a ton is announced for second quarter business, the market continues substantially unchanged at 1.95c. to 2c., f.o.b. nearest mill to consumer, or on the basis of Pencoyd, Pa., 2.01c. to 2.06c., delivered Philadelphia. With bars and plates on a higher level, however, shape producers expect to maintain the present quotations with less shading of prices. Only a small tonnage of fabricated steel contracts is being placed, but some desirable business is in prospect. A 40-story building to contain offices and space for the Manufacturers' Club is being considered for the present site of that club.

Plates.—Quotations have been advanced to 2.05c., Coatesville, or 2.15c., delivered Philadelphia, for current and second quarter delivery. Mills are maintaining up to 80 per cent operation. Contracting for second quarter has not yet been begun, so that the recently announced advance of $1 a ton is as yet untested. Local plate producers point out that there is still a good volume of prospective shipbuilding, which, when awarded, may bring some tonnage to eastern Pennsylvania mills.

Sheets.—Tonnage on makers' books is heavy and deliveries have become extended to four to six weeks, the greatest delays being on automobile body and electrical sheets. Most producers of black and galvanized sheets have announced an advance of $2 a ton, but no test of the new price has been made. Meanwhile, although black sheets have been quoted at 2.85c., Pittsburgh, or 3.17c., Philadelphia, and galvanized at 3.60c., Pittsburgh, or 3.92c., Philadelphia, some consumers have been receiving deliveries on contracts at prices $1 to $2 a ton lower, so that the recently announced advance of $2 will mean an increase to these buyers of $3 and $4 a ton over their previous purchase price. Blue annealed sheets are fairly firm at 2.20c., Pittsburgh, or 2.52c., Philadelphia. Cold-rolled strip mills are meeting delivery promises with difficulty, in some cases asking six weeks and longer on new business.

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier	2.70c.
Plates, ⅜-in.	2.90c.
Structural shapes	2.70c.
Soft steel bars, small shapes, iron bars (except bands)	2.80c.
Round-edge iron	3.50c.
Round-edge steel, iron finished 1½ x 1½ in.	3.50c.
Round-edge steel, planished	4.30c.
Reinforc. steel bars, sq. twisted and deform.	2.60c. to 2.80c.
Cold-fin. steel, rounds and hex.	3.50c.
Cold-fin. steel. sq. and flats	4.00c.
Steel hoops	3.40c.
Steel bands, No. 12 to ⅜-in., inclus.	3.15c.
Spring steel	5.00c.
*Black sheets (No. 24)	4.00c.
†Galvanized sheets (No. 24)	4.75c.
Blue ann'l'd sheets (No. 10)	3.15c.
Diam. pat. floor plates—	
¼-in.	5.30c.
⅜-in.	5.50c.
Rails	3.20c.
Swedish iron bars	6.60c.

*For 50 bundles or more; 10 to 49 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.
†For 50 bundles or more; 10 to 49 bun, 4.95c. base; 1 to 9 bun., 5.30c. base.

Imports.—In the week ended Feb. 23, pig iron arrivals at this port totaled 2995 gross tons, of which 2000 tons came from the United Kingdom and 995 tons from British India. A total of 440 tons of spiegeleisen arrived from the United Kingdom. Steel imports consisted of 982 tons of iron skelp from France, 251 tons of structural shapes from Germany and 77 tons of steel bars, of which 52 tons came from Belgium and 25 tons from Germany.

Old Material.—All grades of scrap show a downward trend. No. 1 heavy melting steel is off 50c. a ton, following the purchase of a tonnage at $16 by a consumer at Bethlehem. Two other mills in the district, however, have bought good-sized tonnages in the past week at $16.50, delivered. No. 2 heavy melting steel has been bought at $12.25 per ton by a Pottsville, Pa., mill, but the latest purchase by a Harrisburg user was at $13 per ton. Other grades are quiet and, in the absence of transactions or firm offers, prices are unchanged.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel	$16.00 to $16.50
Scrap T rails	15.50 to 16.00
No. 2 heavy melting steel	12.25 to 13.00
No. 1 railroad wrought	16.00 to 16.50
Bundled sheets (for steel works)	11.00 to 11.50
Hydraulic compressed, new	14.50 to 15.50
Hydraulic compressed, old	13.00 to 13.50
Machine shop turnings (for steel works)	11.00 to 11.50
Heavy axle turnings (or equiv.)	13.50 to 14.00
Cast borings (for steel works and roll. mill)	11.00 to 11.50
Heavy breakable cast (for steel works)	16.00
Railroad grate bars	12.50 to 13.00
Stove plate (for steel works)	12.50 to 13.00
No. 1 low phos., hvy., 0.04% and under	20.00 to 21.00
Couplers and knuckles	19.00 to 19.50
Rolled steel wheels	18.50
No. 1 blast f'nace scrap	10.00 to 10.50
Wrot. iron and soft steel pipes and tubes (new specific.)	15.50
Shafting	18.50 to 19.00
Steel axles	22.00 to 23.00
No. 1 forge fire	13.00 to 14.00
Cast iron carwheels	16.50 to 17.00
No. 1 cast	16.50
Cast borings (for chem. plant)	15.00
Steel rails for rolling	17.00 to 17.50

Iron Foundry for Stamboul

HAMBURG, GERMANY, Feb. 6.—A modern iron foundry is to be established at Stamboul, Turkey, by the Seir-i-Sefain (shipping board) of Stamboul. Details of the plans, bids on which will be requested shortly, are obtainable from the Seir-i-Sefain.

New York

Pig Iron Demand for Second Quarter is Slowly Increasing —Structural Steel Market More Active

NEW YORK, Feb. 26.—Interest in second quarter pig iron requirements is gradually increasing, although purchases to date are much smaller than at this time a year ago. Bookings by local sellers during the week totaled between 9000 and 10,000 tons, a slight gain over sales of the previous week. The Foran Foundry & Mfg. Co., Flemington, N. J., has closed against its inquiry for 2000 tons of foundry, and orders have been placed by the New York Air Brake Co. for 1400 tons for its Watertown, N. Y., plant. The inquiry of the Worthington Pump & Machinery Corporation for 3900 tons is still open. The General Electric Co. has entered the market for 250 tons of No. 2X for its Bayway, N. J., plant and 400 tons of No. 2X and No. 1X for Schenectady, N. Y. Market activity is more pronounced in New England than in this territory. The H. B. Smith Co., Westfield, Mass., has closed for 2000 to 4000 tons of foundry. Prices of Buffalo foundry iron range from $17 to $17.50, base furnace, while eastern Pennsylvania foundry is bringing $19.50, base furnace. The eastern New York and New England furnaces are quoting competitive delivered prices. A cargo of Dutch iron has been unloaded at Bridgeport, Conn., virtually all of it having been sold before arrival. Dutch foundry is quoted at $22 to $22.25, duty paid port of entry, for No. 1X and lower silicon grades.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil. 1.75 to 2.25	$21.91 to $22.41
*Buf. No. 2, del'd east. N. J.	20.28 to 20.78
East. Pa. No. 2 fdy., sil. 1.75 to 2.25	20.89 to 22.02
East. Pa. No. 2X fdy., sil. 2.25 to 2.75	21.39 to 22.52
East. Pa. No. 1X fdy., sil. 2.75 to 3.25	21.89 to 23.02

Freight rates: $4.91 from Buffalo, $1.39 to $2.52 from eastern Pennsylvania.
*Price delivered to New Jersey cities having rate of $3.28 a ton from Buffalo.

Plates, Shapes and Bars.—Although most of the leading producers of plates, shapes and bars have announced to their customers that their prices have been advanced $1 a ton for second quarter and for material to be shipped in this quarter not covered by contracts, some uncertainty still exists as to the effectiveness of the advance. A few mills making plates and shapes have taken no positive action, but appear to be waiting for a working out of the price situation as it may affect second quarter contracting. The asking prices at Eastern basing points are 2.05c., minimum, at Coatesville for plates and 2.05c., Bethlehem, for shapes. Plate mills have not been as insistent as bar mills in demanding that contract specifications be sent in 15 days before the expiration of a quarter, and, in fact, have accepted specifications up to the last day of a quarter. This situation raises a question as to how much plate tonnage may be carried over from this quarter to the next. Moreover, plate prices have recently been subject to concessions on the more important tonnages, although the market has been quite steady on the ordinary tonnages. A few small bar contracts for second quarter have been made at 1.95c., Pittsburgh, but otherwise buyers have not shown much interest in their requirements for the next quarterly period. Lettings of fabricated structural steel included 5700 tons for an office building at 1441 Broadway, which went to the Hay Foundry & Iron Works, and 4200 tons for a building at Madison Avenue and Forty-first Street, taken by A. E. Norton, Inc. Plans are out for a 50-story office building to be erected by the Irving Trust Co. at 1 Wall Street, which will require approximately 12,000 tons of fabricated steel. Building operations are very active in the East Side residential districts and a number of large apartment buildings are expected to be let in the near future.

Mill prices per lb., deliv'd New York: Soft steel bars, 2.24c. to 2.29c.; plates, 2.17½c. to 2.22½c.; struc. shapes, 2.14c. to 2.19½c.; bar iron, 2.14c.

Sheets and Strips.—Price advances of $2 a ton on black, galvanized and blue annealed sheets, which were announced recently by a number of makers, have not stimulated the market noticeably. Not all makers represented in this territory have adopted the advances on the black and galvanized products, and consumers, many of whom are well protected for the remainder of the present quarter at prices $2 a ton under recent levels, are not disposed to show much interest in their second quarter requirements. It is thought by some that the purpose of the price advance is to establish the former quotations of 2.85c., 3.60c. and 2.10c., Pittsburgh, on black, galvanized and blue annealed sheets respectively, as minimums for second quarter contracting, and it remains to be seen whether the mills will hold firmly to the new levels on future business. With heavy demands for shipments to the automotive industry, the mills are operating at a high rate and some offices in this district are meeting with difficulty in getting shipments to their customers whose requirements are not large. On hot-rolled strip steel, 1.90c. and 2c., Pittsburgh or Cleveland, are the common quotations, while cold-rolled strips are now offered at 2.85c.

Reinforcing Bars.—The Concrete Steel Co. has booked 420 tons for a National Biscuit Co. manufacturing building at Beacon, N. Y. Except for this, business has been confined largely to lots of less than 100 tons, but the volume has been fairly satisfactory for this season of the year. Bids will be opened on March 4 by the Port of New York Authority on 550 tons of bars for a bridge over the Kill van Kull, connecting Bayonne, N. J., and Port Richmond, S. I. Several other large tonnages are being figured, but new work is coming out slowly. Prices are steady and unchanged.

Warehouse Business.—Demand is improving, except in structural material, which continues quiet. Sheet

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and structural shapes	3.30c.
Soft steel bars, small shapes	3.25c.
Iron bars	3.24c.
Iron bars, Swed. charcoal	7.00c. to 7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons	3.50c.
Flats and squares	4.00c.
Cold-roll. strip, soft and quarter hard	5.15c. to 5.40c.
Hoops	4.25c.
Bands	3.75c.
Blue ann'l'd sheets (No. 10)	3.85c. to 3.90c.
Long terne sheets (No. 24)	5.80c.
Standard tool steel	12.00c.
Wire, black annealed	4.50c.
Wire, galv. annealed	5.15c.
Tire steel, 1½ x ½ in. and larger	3.30c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.65c.
Open-hearth spring steel, bases,	4.50c. to 7.00c.

	Per Cent Off List
Machine bolts, cut thread:	
¾ x 6 in. and smaller	60
1 x 30 in. and smaller	50 to 50 and 10
Carriage bolts, cut thread:	
½ x 6 in. and smaller	60
¾ x 20 in. and smaller	50 to 50 and 10
Coach screws:	
½ x 6 in. and smaller	60
1 x 16 in. and smaller	50 to 50 and 10

Boiler Tubes—	Per 100 Ft.
Lap welded, 2-in.	$17.33
Seamless steel, 2-in.	20.24
Charcoal iron, 2-in.	25.00
Charcoal iron, 4-in.	67.00

Discounts on Welded Pipe

Standard Steel—	Black	Galv.
⅛-in. butt	46	29
¼-in. butt	51	37
1-3-in. butt	53	39
2½-6-in. lap	48	35
7 and 8-in. lap	44	17
11 and 12-in. lap	37	12
Wrought Iron—		
⅛-in. butt	5	+19
¼-in. butt	11	+ 9
1-1½-in. butt	14	+ 6
2-in. lap	5	+14
3-6-in. lap	11	+ 6
7-12-in. lap	3	+16

Tin Plate (14 x 20 in.)

	Prime	Seconds
Coke, 100 lb. base box	$6.45	$6.20
Charcoal, per Box—	A	AAA
IC	$9.70	$12.10
IX	12.00	14.25
IXX	13.90	16.00

Terne Plate (14 x 20 in.)

IC—20-lb. coating	$10.00 to $11.00
IC—30-lb. coating	12.00 to 13.00
IC—40-lb. coating	13.75 to 14.25

Sheets, Box Annealed—Black, C. R. One Pass

	Per Lb.
Nos. 18 to 20	3.80c.
No. 22	3.95c.
No. 24	4.00c.
No. 26	4.10c.
No. 28*	4.25c.
No. 30	4.50c.

Sheets, Galvanized

	Per Lb.
No. 14	4.40c.
No. 16	4.25c.
No. 18	4.40c.
No. 20	4.50c.
No. 22	4.60c.
No. 24	4.75c.
No. 26	5.00c.
No. 28*	5.25c.
No. 30	5.65c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

prices are fairly well maintained, with only occasional concessions from the current quotations.

Cast Iron Pipe.—Quotations on pressure pipe show considerable irregularity, some recent bids of Northern makers at public openings having been several dollars a ton under usual quotations. Inquiry from municipalities is increasing, but tonnages are in most cases small. About 1500 tons of 24-in. water pipe has been placed by Brockton, Mass., with the Warren Foundry & Pipe Co., Donaldson Iron Co. and a Brockton supply company. Madison, N. J., has awarded 165 tons of 6, 8 and 10-in. water pipe to the low bidder, R. D. Wood & Co., who will furnish centrifugal pipe. South Orange, N. J., has awarded 200 tons of 10 and 12-in. Class A pipe to the Herbert Kennedy Co., New York, agent for the Pont-a-Mousson Works. Montclair, N. J., has opened bids on 150 tons of water pipe, but no award has been announced. Award of about 8500 tons of gas pipe by the United Gas Improvement Co., Philadelphia, to the low bidder, the Herbert Kennedy Co., is still pending.

Prices per net ton deliv'd New York: Water pipe, 6-in. and larger, $38.60 to $40.60; 4-in. and 5-in., $43.60 to $45.60; 3-in., $53.60 to $55.60. Class A and gas pipe, $3 extra.

Coke.—Standard furnace coke shows continued strength, with quotations for spot shipment ranging from $3 to $3.25 per ton, Connellsville. A Phillipsburg, N. J., consumer of furnace coke recently bought about 300 tons for spot shipment at a price equivalent to $2.85 per ton, Connellsville, but the tonnage is believed to have come from an operation quoting $3.25 per ton, ovens, on a freight rate 40c. a ton less than from Connellsville. Standard foundry is inactive and quotations range from $3.50 to $3.75 per ton, Connellsville. Special brands are unchanged at $4.85 per net ton, ovens, or $8.56, delivered to northern New Jersey, Jersey City and Newark, and $9.44 to New York and Brooklyn. By-product coke continues at $9 to $9.40 per net ton, Newark or Jersey City, and $10.06, New York or Brooklyn.

Old Material.—Buying prices of No. 1 heavy melting steel are unchanged at $15.50 to $16 per ton, delivered eastern Pennsylvania. In the past week, a consumer at Bethlehem, Pa., has closed on about 25,000 tons at $16 per ton, delivered; a Coatesville, Pa., mill has bought 7000 to 8000 tons, and a Claymont, Del., user about 5000 tons at $16.50 per ton. Yard grade is still being bought at $12.25 per ton, delivered Pottsville, Pa., although the consumer there has closed on a small tonnage of yard steel at $12.25 per ton. Brokers are paying $12.50 per ton, delivered Phoenixville, Pa., and $13 per ton, delivered Conshohocken, Pa., for No. 2 heavy melting steel. No. 1 forge fire shows a slight advance in the buying price, following the recent sale of a small tonnage at $14 per ton, eastern Pennsylvania. Specification pipe is quiet, with brokers offering $15.50 and in some instances $15.75 per ton, delivered Lebanon, Pa.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel	$12.50 to	$12.85
Heavy melting steel (yard)	8.50 to	9.50
No. 1 hvy. breakable cast	11.75 to	12.00
Stove plate (steel works)	8.75 to	9.00
Locomotive grate bars	8.75 to	9.00
Machine shop turnings	7.50 to	8.00
Short shoveling turnings	7.50 to	8.00
Cast borings (blast furn. or steel works)	7.00 to	7.25
Mixed borings and turnings	6.50 to	7.00
Steel car axles	18.25 to	18.75
Iron car axles	24.50 to	25.00
Iron and steel pipe (1 in. dia., not under 2 ft. long)	11.75 to	12.00
Forge fire	9.50 to	10.50
No. 1 railroad wrought	12.50 to	13.00
No. 1 yard wrought, long	11.50 to	12.00
Rails for rolling	13.50 to	13.75
Cast-iron carwheels	12.50 to	12.75
Stove plate (foundry)		9.50
Malleable cast (railroad)	13.00 to	14.00
Cast borings (chemical)		11.50

Prices per gross ton, deliv'd local foundries:

No. 1 machry. Cast	$17.00
No. 1 hvy. cast (columns, bldg. materials, etc.), cupola size	15.00
No. 2 cast (radiators, cast boilers, etc.)	14.50

Cleveland

Price Advance on Plates, Shapes and Bars Generally Adopted—Cold-Rolled Strip Reverts to 2.85c.

CLEVELAND, Feb. 26.—The $1 a ton price advance on steel bars, plates and structural material to 1.95c., Pittsburgh, has been generally adopted, and local mills have made a corresponding advance to 1.95c., Cleveland, for steel bars, which outside mills quote at 2c., Cleveland. While a few small-lot orders have been taken at the new prices, makers are not endeavoring to close second quarter contracts for steel bars, plates and shapes and buyers are in no hurry to make commitments. Cleveland and Youngstown mills have advanced semi-finished steel $1 a ton and some wire mills have reaffirmed for the second quarter present prices on wire products and wire rods. Cold-rolled strip has reverted to the 2.85c. price that has prevailed during the present quarter, manufacturers evidently having decided not to attempt to put in effect both a price advance and the new card of extras.

Specifications continue heavy from the automotive industry for carbon and alloy steel bars, sheets and strip steel, and mills are getting a good volume of orders from other metal-working industries. February business will about equal in volume the amount entered in January. Production in the automotive industry still shows an upward tendency, at least on the part of some manufacturers, and many cars are being put in storage in anticipation of a heavy spring demand.

While deliveries are extended considerably on some products, mills with present high operations are keeping up well with the demand, although there is pressure here and there for deliveries.

Structural activity, which recently experienced a lull, shows an improvement. Detroit has rejected bids for 8000 tons of steel pipe and will readvertise.

Pig Iron.—Sales for the second quarter continue to be heavy. Cleveland interests closed for 53,000 tons of foundry and malleable iron during the week. This included 20,000 tons of foundry iron, the sale of which was reported by a Cleveland maker for shipment outside of the State, and for which other producers evidently were not given an opportunity to compete. Inquiries are still plentiful, one being for 5000 tons of foundry iron. Shipments showed a gain this month over those of January for most furnaces. One leading producer will ship 25 per cent more iron during the first two months of this year than in the corresponding months last year. The demands from the automotive industry continue large. The Ford Motor Co., which has been replacing stampings with malleable castings for some parts on its Model A cars, is reported now to be using about as much malleable iron per car as in its old Model T cars. This has helped materially to increase the business of some of the malleable foundries. With the sale of a round lot of Lake iron for water shipment to western Michigan and the approach of the opening of Lake navigation, there is considerable talk of the extent to which boat iron may become a factor in the market this season and its competitive effect at certain points on or near the Great Lakes. There is no change in prices. Cleveland furnaces are quoting foundry and malleable iron at $18.50 for outside shipment. Other Lake furnaces are holding to $19, except for Michigan shipment, for which $20 is rather generally adhered to. Valley furnaces show no disposition to quote higher than $17.50 for foundry iron.

Prices per gross ton at Cleveland:

N'th'n fdy., sil. 1.75 to 2.25		$19.50
S'th'n fdy., 1.75 to 2.25	$22.50 to	23.00
Malleable		19.50
Ohio silvery, 8 per cent		29.00
Basic Valley furnace		17.50
Stand. low phos., Valley	26.50 to	27.00

Prices, except on basic and low phosphorus, are delivered Cleveland. Freight rates: 50c. from local furnaces; $3 from Jackson, Ohio; $6 from Birmingham.

Semi-Finished Steel.—Prices have been advanced $1 a ton by Cleveland and Valley mills to $35, Cleveland and Youngstown, for sheet bars and $34 for large billets and slabs. These prices apply to current orders and for second quarter contracts. However, most consumers are covered for this quarter and little tonnage is available for the remainder of the quarter. Specifications are still taxing the capacity of mills. The reaffirming by one mill of the present

$42 price for wire rods for the second quarter was announced last week and other producers have taken similar action.

Strip Steel.—With the new extras on cold-rolled strip, which have been generally adopted, mills have restored the 2.85c. Cleveland and Pittsburgh base price, which will apply on second quarter contracts. An advance to 2.95c. was announced shortly before the new card of extras was issued. This card sharply increases narrow strip and makes deep reductions on wide strip. Fender stock does not come under the card of extras and is quoted at the recent advance, or 4.35c. for No. 20 gage. Specifications are heavy for both hot and cold-rolled strip, and mills are four weeks or longer in making deliveries. The new prices on hot-rolled strip have not been tested, but mills do not expect to find much resistance to the advance in view of the large demand.

Coke.—Shipments of foundry coke against contracts are heavy, but there is not much new business and consumers are not yet showing an interest in second quarter contracts. Prices are unchanged. Ohio by-product foundry coke is quoted at $7.75, Painesville.

Bolts, Nuts and Rivets.—Specifications for bolts and nuts are fairly good. The demand from the automotive industry is large, and railroads, as well as consumers in other fields and jobbers, are ordering liberally. Present prices are expected to be reestablished for the second quarter, although makers probably will have to pay more for their raw material, both bars and wire. Rivets are moving in fair volume. There has not been much of a test of the $4 a ton advance on large rivets, although some small-lot sales have been made at the higher price.

Sheets.—The American Sheet & Tin Plate Co. and most independent makers have joined in the $2 a ton price advance on black, blue annealed and galvanized sheets, but no sales are reported at the higher prices. Most mills have so much tonnage on their books that they show no desire to close second quarter contracts. Some are holding their own on deliveries and others are getting further behind. Four weeks seems to be the best delivery promise on auto body sheets. There are still reports of an occasional concession to 2.75c. on black sheets, but the price advance appears to have strengthened galvanized sheets, which have been weak. Some of the mills have informed their customers that specifications against first quarter contracts must be in by March 15.

Cold-Finished Steel Bars.—All makers appear to be holding to the $2 a ton advance, and some business has been taken at the new 2.35c., Cleveland, price. Makers have set March 15 as the deadline for specifications against first quarter contracts.

Wire Products.—Several independent mills have reaffirmed present prices for the second quarter. Not much business has been taken at these prices for the current quarter, but it is asserted that lower-priced contracts have now been well worked off.

Old Material.—Some new consumer demand for heavy melting steel developed in the local market during the week. Scrap is coming out in good volume, but is being well absorbed, as mills are taking large shipments on outstanding contracts. Heavy melting steel and cast scrap are firm, but blast furnace grades and machine shop turnings lack strength. No. 1 railroad heavy melting steel is bringing $18 in the local market. Dealers are paying $11.65 for blast furnace scrap. Low phosphorus forging crops brought $19.75 for a several hundred-ton lot. The Chevrolet Motor Co. has issued a March list of 8100 tons, of which 4400 tons is offered at its Flint, Mich., plant, and 3700 tons at its gear and axle plant in Detroit.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades	
No. 1 heavy melting steel	$15.50 to $16.00
No. 2 heavy melting steel	15.00 to 15.50
Compressed sheet steel	15.00 to 15.50
Light bundled sheet stamp'gs	12.00 to 12.50
Drop forge flashings	13.00 to 13.25
Machine shop turnings	10.75 to 11.00
No. 1 railroad wrought	13.25 to 13.50
No. 2 railroad wrought	16.00 to 16.50
No. 1 busheling	12.50 to 13.00
Pipes and flues	9.00 to 9.50
Steel axle turnings	12.50 to 13.00
Acid Open-Hearth Grades	
Low phos. forging crops	19.00 to 19.50
Low phos., billet, bloom and slab crops	18.50 to 19.00
Low phos. sheet bar crops	18.00 to 18.50
Low phos. plate scrap	18.00 to 18.50
Blast Furnace Grades	
Cast iron borings	11.50 to 11.75
Mixed bor'g and short turn'gs	11.50 to 11.75
No. 2 busheling	11.50 to 11.75
Cupola Grades	
No. 1 cast	16.50 to 17.00
Railroad grate bars	11.00 to 12.00
Stove plate	12.00 to 12.50
Rails under 3 ft	16.75 to 17.25
Miscellaneous	
Railroad malleable	16.00 to 16.50
Rails for rolling	16.25 to 16.50

Warehouse Prices, f.o.b. Cleveland

	Base per Lb.
Plates and struc. shapes	3.00c.
Soft steel bars	3.00c.
Reinforc. steel bars	2.25c. to 2.50c.
Cold-fin. rounds and hex	3.65c.
Cold-fin. flats and sq.	4.15c.
Hoops and bands, No. 12 to ¼ in., inclusive	3.25c.
Hoops and bands, No. 13 and lighter	3.65c.
Cold-finished strip	*5.95c.
Black sheets (No. 24)	3.50c.
Galvanized sheets (No. 24)	4.45c.
Blue ann'l'd sheets (No. 10)	3.25c.
No. 9 ann'l'd wire, per 100 lb	$2.95
No. 9 gal. wire, per 100 lb	3.40
Com. wire nails, base per keg	2.95

*Net base, including boxing and cutting to length.

Union Steel Corporation of South Africa, Ltd., which operates the only blast furnace in Africa, informs THE IRON AGE that the output of this furnace from Oct. 17, 1928, when it resumed operations, to Jan. 1 was 9984 tons. J. K. Eaton is resident director of the company.

Reinforcing Steel

Awards of 2900 Tons—2000 Tons in New Projects

AWARDS reported to THE IRON AGE during the last week amounted to about 2900 tons, a total considerably below the average of recent weeks. New projects call for 2000 tons. Awards follow:

BEACON, N. Y., 420 tons, factory for National Biscuit Co.; from John W. Cowper Co., Buffalo, general contractor, to Concrete Steel Co.

PENNSYLVANIA RAILROAD, 875 tons, several bridges, to Taylor-Davis, Inc.

CHICAGO, 100 tons, Chicago, Milwaukee, St. Paul & Pacific Railroad, to four bidders.

CHICAGO, 420 tons, Board of Trade Building, to Olney J. Dean & Co.

CHICAGO, 500 tons, hospital, to Calumet Steel Co.

CHICAGO, 170 tons, apartment building at Twenty-first Street and Troy Avenue.

CHICAGO, 250 tons, garage, to Concrete Steel Co.

BELLINGHAM, WASH., 175 tons, Charles apartment building, to Northwest Steel Rolling Mills.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

BAYONNE, N. J., 550 tons, bridge over Kill van Kull between Bayonne and Port Richmond, S. I., for Port of New York Authority; bids March 4.

CLEVELAND, 350 tons, depot platforms and track slabs for Cleveland Union Terminals Co.

CINCINNATI, 700 tons, building for Cincinnati & Suburban Bell Telephone Co.

CINCINNATI, 400 tons, factory addition for Crosley Radio Corporation.

Inland Steel Co. to Add 10-In Bar Mill

The Inland Steel Co., Chicago, announces a building program which includes a 10-in. bar mill, a six-story office building and a new jobbing mill, all to be built at the Indiana Harbor works. The bar mill will be a combination continuous and cross country type, and will be constructed on the lake front, adjacent to the company's 14-in. bar mill.

The office building will be situated across the Indiana Harbor Belt Railroad tracks. This will include offices for the general superintendent, the purchasing department, the mill accounting department, the paymaster's department and the engineering department and drafting rooms.

The new jobbing mill will be located in the present sheet mill department and will roll sheets up to 72 in. wide.

This company is now building 74 Becker Type Koppers coke ovens.

The Pittsfield Works of the General Electric Co. has booked an order for 21 large transformers to cost $1,000,000 for a Vermont power development.

Pacific Coast

Structural Steel and Cast Iron Pipe Most Active Lines—Prices Fairly Firm on All Products

SAN FRANCISCO, Feb. 23 (*By Air Mail*).—Among the more important awards of the past week were 1936 tons of sheet piling for Long Beach, Cal., 1500 tons of plates for a pipe line at Denver and 1700 tons of cast iron pipe for Los Angeles. Demand in most lines continues well sustained, shapes and cast iron pipe being the most active. The price structure is now on a fairly firm basis, plates appearing to be the weakest commodity.

Pig Iron.—Most sales and inquiries for foundry pig iron involve small lots. Foundry operations have shown some improvement, especially in the southern part of the State.

Prices per gross ton at San Francisco:

*Utah basic	$25.00 to $26.00
*Utah fdy., sil. 2.75 to 3.25	25.00 to 26.00
**Indian fdy., sil. 2.75 to 3.25	24.00 to 25.00

*Delivered San Francisco.
**Duty paid, f.o.b. cars San Francisco.

Bars.—The Northwest Steel Rolling Mills took 175 tons of reinforcing steel bars for an apartment at Bellingham, Wash. While no large inquiries came up for figures this week, bar distributers report a fair aggregate pending in small lots. Out-of-stock prices continue to range from 2.20c. to 2.30c., base, on carload lots, with 2.60c. applying on less than carloads. Merchant bars remain at 2.30c., c.i.f. Coast ports.

Plates.—The Lock Joint Pipe Co. secured the contract for 60-in. pipe for the Denver Board of Water Commissioners and will supply reinforced concrete steel-lined pipe, requiring 1500 tons of plates. Bids were opened this week on 120 tons of 12 to 16-in. welded steel pipe for Upland, Cal., on which the Los Angeles Mfg. Co. was low bidder. The Pacific Gas & Electric Co., San Francisco, has an inquiry out for one 10,000,000 cu. ft. and one 8,000,000 cu. ft. gas holder for the bay district, which will require about 10,000 tons of plates and shapes. Prices range from 2.20c. to 2.25c., c.i.f.

Shapes.—A fair tonnage of structural shapes was placed during the week. Steel, Inc., Los Angeles, took 1936 tons of sheet piling for Long Beach, Cal., and will supply German material. Other awards included 687 tons for a bank at Beverly Hills, booked by the Consolidated Steel Corporation, and 350 tons for a club in Los Angeles, taken by the McClintic-Marshall Co. The Pacific Coast Engineering Co. is low bidder on 700 tons for a medical building in Oakland. Considerable new work is in sight or pending, and fabricators believe most of it will be placed during the next 30 days. Plain material continues firm at 2.35c., c.i.f. Coast ports.

Cast Iron Pipe.—Awards of cast iron pipe this week were the second heaviest of the year and exceeded 3400 tons. Bookings were as follows:

SEATTLE, 679 tons 4 to 10-in. Class B, improvement of Normandy Park, Seattle, to American Cast Iron Pipe Co.

LOS ANGELES, 1710 tons 12-in. Class 350: 1140 tons to American Cast Iron Pipe Co. and 570 tons to the Pacific States Cast Iron Pipe Co.

OAKLAND, 1084 tons of 12-in. Classes B and 150, East Bay Municipal Utility District: 195 tons 10 and 12-in. Class B to American Cast Iron Pipe Co.; 182 tons of 8-in. Class 150 to United States Cast Iron Pipe & Foundry Co., and 707 tons of 2 to 6-in. Class 150 to Pacific States Cast Iron Pipe Co.

The Pacific States Cast Iron Pipe Co. was low on 1350 tons of 2 to 10-in. Class B pipe for Lomita District No. 13, Los Angeles, and on 113 tons of 4 to 12-in. Class 150 for Monterey Park, Cal. The American Cast Iron Pipe Co. was low on 338 tons of 4 to 12-in. Class B for Anaheim, Cal. S. A. Moceri, Inc., was low on 315 tons of 6 and 10-in. Class B for the improvement of Brown's Point Boulevard, Tacoma, Wash. Bids have been opened on 349 tons of 12-in. Class B, 150 or 250 pipe for Glendora, Cal. Argentieri & Colorossi were low on 440 tons of 6 to 12-in. Classes B and C pipe for the improvement of Thirty-first Avenue South, Seattle. Bids were opened on 231 tons of 4 and 6-in. Classes B and C for the improvement of Massachusetts Avenue, San Diego, and on 145 tons of 6 and 8-in. Class B pipe for Puyallup, Wash. New inquiries include 2173 tons of 4 to 24-in. Class B pipe for South Fifty-sixth Street, Tacoma, 215 tons of 4 and 6-in. Class C pipe for El Prado Avenue, San Diego, and 144 tons of 4 and 6-in. Class B pipe for Plata Avenue, San Diego. Imports of European cast iron pipe during November, 1928, totaled 4691 tons, compared with 3015 tons in the previous month. About 4000 tons came from French foundries, the rest from German plants.

Steel Pipe.—Oil country goods continue in good demand. Importations of tubular products during November, 1928, totaled 4217 tons, compared with 3667 tons in the preceding month.

Coke.—Demand for foundry coke reflects the quiet condition in the pig iron market. In November, 1928, imports totaled 3396 tons. Of the total, 1381 tons came from Netherlands, the United Kingdom supplying the next largest amount, 976 tons.

Warehouse Prices, f.o.b. San Francisco

	Base per Lb.
Plates and struc. shapes	3.15c.
Soft steel bars	3.15c.
Small angles, ⅞-in. and over	3.15c.
Small angles, under ⅞-in.	3.55c.
Small channels and tees, ¾-in. to 2¾-in.	3.75c.
Spring steel, ¼-in. and thicker	5.00c.
Black sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.80c.
Galv. sheets (No. 24)	5.30c.
Struct. rivets, ½-in. and larger	5.65c.
Com. wire nails, base per keg	$3.40
Cement c't'd nails, 100 lb. keg	3.40

Buffalo

Foundries Buy About 25,000 Tons of Pig Iron Mostly for Second Quarter—Steel Scrap Declines

BUFFALO, Feb. 26.—Pig iron consumers in this district and in New England who have been slow to anticipate their second quarter requirements came into the market during the past week in force and bought a total of about 25,000 tons, much of which was in lots ranging from 1000 to 3000 tons. Excepting some small lots for fill-in requirements, all of the iron sold was for the next quarter. Foundries in nearly every branch of industry were among the purchasers, one or two lines which have been dull for years having been represented. On business coming from New England or the lower New York State district, it was necessary for local furnaces to go as low as $17, furnace, but it is said that $18.50, base, was obtained on all orders from consumers within the immediate Buffalo district. Current inquiry includes 2000 tons from a melter in the central part of the State, 400 tons for Schenectady and 250 tons for Bayway, N. J.

Prices per gross ton, f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25	$18.50
No. 2X fdy., sil. 2.25 to 2.75	19.00
No. 1 fdy., sil. 2.75 to 3.25	20.00
Malleable, sil. up to 2.25	19.00
Basic	17.50
Lake Superior charcoal	27.28

Finished Iron and Steel.—Steel mill operations ranging from 85 to 90 per cent are sustained by a steady flow of orders and specifications for nearly all products made in this district. Buffalo mills have advanced quotations on plates, shapes and bars to a range of 2.05c. to 2.10c., Lackawanna, but as second quarter contracting has not yet been begun these prices have had no real test. The local sheet maker has followed the advance of $2 a ton on the common finishes announced within the past week or two by other sheet producers. Some sellers here report an acute shortage of sheet bars at their mills; it was necessary for an Ohio company to shut

Warehouse Prices, f.o.b. Buffalo

	Base per Lb.
Plates and struc. shapes	3.40c.
Soft steel bars	3.30c.
Reinforcing bars	2.75c.
Cold-fin. flats, sq. and hex.	4.45c.
Rounds	3.95c.
Cold-rolled strip steel	5.85c.
Black sheets (No. 24)	4.20c.
Galv. sheets (No. 24)	4.85c.
Blue ann'l'd sheets (No. 10)	3.50c.
Com. wire nails, base per keg	$3.60
Black wire, base per 100 lb.	3.75

down some of its sheet mills for a few days because of lack of sheet bars. Hot-rolled strip is steady at the recent advance in prices; deliveries quoted by one leading producer range from five to six weeks.

Old Material.—A Buffalo steel company, which recently has not been conspicuous in the scrap market, last week bought 10,000 tons or more of Nos. 1 and 2 heavy melting steel, paying $16.50 for the former grade and $15 for the secondary grade. This purchase, it is believed, does not represent all of this mill's immediate requirements, and further orders are expected soon. The price paid for the No. 1 steel is $1.50 a ton below the last price paid by another mill. The low price is partly explained by the fact that the purchaser usually takes in as No. 2 steel what it rejects as No. 1, and by so doing is able to induce a lower price on No. 1 steel. However, the market as a whole is somewhat easier, although there are exceptions, such as No. 1 machinery cast, which is in strong demand at $16.50 to $17, and scrap rails, stove plate and specialties. For shipment out of this district, $20, Buffalo, has been paid for short rails, and more than $20 was paid for 18-in. rails. Stove plate is scarce and commands $15, this price having been paid by dealers to apply against $14.50 orders.

Prices per gross ton, f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades	
No. 1 heavy melting steel	$16.50 to $17.50
No. 2 heavy melting steel	15.00
Scrap rails	17.00 to 18.00
Hydraul. comp. sheets	15.00
Hand bundled sheets	12.00 to 12.50
Drop forge flashings	14.00 to 14.50
No. 1 busheling	16.50 to 17.00
Hvy. steel axle turnings	14.00 to 14.50
Machine shop turnings	8.00 to 8.50
No. 1 railroad wrought	13.50 to 14.00
Acid Open-Hearth	
Knuckles and couplers	19.00 to 19.50
Coil and leaf springs	19.00 to 19.50
Rolled steel wheels	19.00 to 19.50
Low phos. billet and bloom ends	20.00 to 20.50
Electric Furnace Grades	
Short shov. steel turnings	13.50 to 14.00
Blast Furnace Grades	
Short mixed borings and turnings	11.50 to 12.50
Cast iron borings	11.50 to 12.50
No. 2 busheling	10.00 to 10.50
Rolling Mill Grades	
Steel car axles	18.75 to 19.25
Iron axles	21.00 to 22.00
Cupola Grades	
No. 1 machinery cast	16.00 to 17.00
Stove plate	14.50 to 15.00
Locomotive grate bars	13.50 to 14.00
Steel rails, 3 ft. and under	19.50 to 20.00
Cast iron carwheels	14.00 to 14.50
Malleable Grades	
Industrial	18.50 to 19.00
Railroad	18.50 to 19.00
Agricultural	18.50 to 19.00

ton, delivered within a $3.10 freight rate zone.

Old Material.—Owners of scrap are still holding out for a higher market, but the tendency of prices is still downward. As a result, a further decline in the movement of material out of New England is reported. A Worcester, Mass., mill is said to have bought a large tonnage of long bundled skeleton. New England foundries are taking textile and No. 1 machinery cast in fairly large volume from yards within trucking distance. Most of the heavy melting steel sold recently was at $12 a ton, on cars shipping point, but in some instances that price has been shaded.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel	$11.75 to $12.25
Scrap T rails	11.50 to 12.00
Scrap girder rails	11.00 to 11.50
No. 1 railroad wrought	11.00 to 11.25
No. 1 yard wrought	9.00 to 9.25
Machine shop turnings	6.50 to 6.60
Cast iron borings (steel works and rolling mill)	6.50 to 7.00
Bundled skeleton, long	9.00 to 10.00
Forge flashings	10.25 to 10.50
Blast furnace borings and turnings	6.00 to 6.50
Forge scrap	9.00 to 9.50
Shafting	14.50 to 15.00
Steel car axles	16.00 to 16.50
Wrought pipe 1 in. in diameter (over 2 ft. long)	10.75 to 11.25
Rails for rolling	12.25 to 12.50
Cast iron borings, chemical	10.00 to 10.50

Prices per gross ton deliv'd consumers' yards:

Textile cast	$14.50 to $15.00
No. 1 machinery cast	16.00 to 16.50
No. 2 machinery cast	14.00 to 14.50
Stove plate	11.00 to 11.50
Railroad malleable	17.00 to 17.50

Boston

Prices on Pig Iron Shaded—Second Quarter Plate Contracts Taken at 1.90c., Pittsburgh

BOSTON, Feb. 26.—Although the pig iron market continues fairly active, prices are still unsettled. During the past few days Buffalo No. 2X was sold at $17 a ton, furnace. Quoted prices of $18.50 on other New York State iron and $20 on Mystic iron have also been shaded. Three Buffalo furnaces are now actively competing here and making low prices when necessary. A Rhode Island foundry has taken an additional tonnage of malleable iron at $17, furnace.

Foundry iron prices per gross ton deliv'd to most New England points:

*Buffalo, sil. 1.75 to 2.25	$21.91 to	$22.91
*Buffalo, sil. 2.25 to 2.75	22.41 to	23.41
East. Penn., sil. 1.75 to 2.25	24.15 to	24.65
East. Penn., sil. 2.25 to 2.75	24.65 to	25.15
Va., sil. 1.75 to 2.25		25.21
Va., sil. 2.25 to 2.75		25.71
Ala., sil. 1.75 to 2.25	23.41 to	25.77
Ala., sil. 2.25 to 2.75	23.91 to	26.27

Freight rates: $4.91 all rail from Buffalo; $3.65 from eastern Pennsylvania; $5.21 all rail from Virginia; $6.91 to $8.77 from Alabama.

*All rail rate.

Plates.—Local representatives have booked quite a plate tonnage the past week or 10 days for second quarter delivery at 1.90c., base Pittsburgh. Bookings were made prior to the advance of $1 a ton. Consumers are specifying against first quarter contracts freely.

Fabricated Steel.—Construction projects are not developing as rapidly as expected, and inroads have been made on fabricators' backlogs. Some large projects are hanging over the market, including a court house addition and the Congress Street bridge.

Coke.—February will be the best month in shipments experienced by New England by-product coke ovens in considerably more than a year. Foundry coke specifications continue to increase. The greatest demand for coke, however, is for domestic sizes. The price remains at $11 a

Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates	3.365c.
Structural shapes—	
Angles and beams	3.365c.
Tees	3.365c.
Zees	3.465c.
Soft steel bars, small shapes	3.265c.
Flats, hot-rolled	4.15c.
Reinforcing bars	3.265c. to 3.54c.
Iron bars—	
Refined	3.265c.
Best refined	4.60c.
Norway rounds	6.60c.
Norway squares and flats	7.10c.
Spring steel—	
Open-hearth	5.00c. to 10.00c.
Crucible	12.00c.
Tie steel	4.50c. to 4.75c.
Bands	4.015c. to 5.00c.
Hoop steel	5.50c. to 6.00c.
Cold-rolled steel—	
Rounds and hex	*3.55c. to 5.55c.
Squares and flats	*4.05c. to 7.05c.
Toe calk steel	6.00c.
Rivets, structural or boiler	4.50c.
	Per Cent Off List
Machine bolts	50 and 5
Carriage bolts	50 and 5
Lag screws	50 and 5
Hot-pressed nuts	50 and 5
Cold-punched nuts	50 and 5
Stove bolts	70 and 10

*Including quantity differentials.

Carnegie Steel Co. Aids State Safety Campaign

The Carnegie Steel Co. is cooperating with the Pennsylvania Department of Labor and Industry in its safety campaign, which is to carry on through 1929. In this campaign every industry has been enlisted, and an appeal to every workman and official is made through pledge cards and buttons. Diplomas are awarded as soon as the pledge cards are signed up by all the men in a plant or department of a plant. Special posters of the drive are seen in many of the plants. The one displayed in plants of the Carnegie Steel Co. tells the men that the State has called upon the industry and asks its employees to line up in the campaign. The poster is 18 by 24 in., in the center being the State coat of arms in black on a yellow background. The coat of arms rests on a steel beam, supported by two muscular workmen, symbolizing the steel industry supporting the State. The poster is the conception of W. H. French of the general safety committee Carnegie Steel Co.

The Manganese Steel Forge Co., Philadelphia, maker of woven manganese steel screens and other manganese steel products, on March 1 will open a sales office at 1714 Clark Building, Pittsburgh. J. H. McKinley will be in charge.

Canada

Dominion Mills Busy with New Orders Piling Up—Second Quarter Pig Iron Buying Expected Next Week

TORONTO, ONT., Feb. 26.—The iron and steel industry of Canada is holding a better position today than in any peace year in the country's history. Practically all plants have benefited by large orders during the past three months. New orders are piling up, with the result that present bookings will not be cleared off for some time. Mills are now specifying deliveries on bars and sheets at from six weeks to two months, and on some other materials delivery dates are even further advanced.

Pig Iron.—Local blast furnace representatives look for good orders for second quarter when books are opened for this business next week. Sales of the week were mostly for spot delivery, although a few melters have made provision for supplies to be delivered during the next two months. Spot sales range from 50 to 200 tons, with occasional orders for as much as 500 tons. The Canadian Furnace Co., Port Colborne, Ont., blew out its furnace Saturday for relining and repairs, but is supplying customers from stock. Prices are unchanged.

Prices per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75	$23.60
No. 2 fdy., sil. 1.75 to 2.25	23.60
Malleable	23.60
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75	$25.00 to 25.50
No. 2 fdy., sil. 1.75 to 2.25	25.00 to 25.50
Malleable	25.00 to 25.50
Basic	24.00 to 24.50
Imported Iron, Montreal Warehouse	
Summerlee	$33.50
Carron	33.00

Structural Steel.—The Sarnia Bridge Co., Sarnia, Ont., reports improvement in business for January of 40 per cent over that of January, 1928. Other fabricators report increased business varying from 30 to 60 per cent. Prices are being asked on about 20,000 tons for the Bank of Commerce Building, Toronto, and a new office building to be erected on Richmond Street. The Bank of Nova Scotia has purchased a site at Bay and King Streets, where it is understood a building will be erected requiring about 10,000 tons of steel. The Standard Steel Construction Co., Welland, Ont., closed a contract for 5000 tons for refinery additions at Port Colborne, Ont., for the International Nickel Co. A number of projects ranging from 100 to 500 tons are pending for early closing.

Rails.—The Calgary, Alberta, city council has awarded the Bethlehem Steel Corporation 492 tons of steel rails at $86.35 per ton; 2500 tie rods were ordered from the Manitoba Bridge & Iron Works, Winnipeg, Man.

Old Material.—A strong demand for both iron and steel grades features the market. Hamilton, Ont., buyers are placing large orders. Inquiries recently received include one for 2000 tons of machinery cast from an Ontario radiator maker and 1000 tons of heavy melting steel from a Montreal consumer.

Dealers' buying prices:

	Per Gross Ton		
	Toronto		Montreal
Heavy melting steel	$9.50		$8.00
Rails, scrap	10.00		9.00
No. 1 wrought	9.00	$11.00 to	11.50
Machine shop turnings	7.00		5.00
Boiler plate	7.00		6.00
Heavy axle turnings	7.50		7.50
Cast borings	7.50		5.00
Steel turnings	7.00		6.50
Wrought pipe	5.00		6.00
Steel axles	14.00		20.00
Axles, wrought iron	16.00		22.00
No. 1 machinery cast	....	16.00 to	17.00
Stove plate	....		13.00
Standard carwheels	....		16.00
Malleable	....		13.00
	Per Net Ton		
No. 1 machinery cast	15.00		....
Stove plate	9.00		....
Standard carwheels	13.00		....
Malleable scrap	13.00		....

Birmingham

Pig Iron Shipments Heavy—Southern Mills Advance Sheets $2 a Ton—Scrap Weak

BIRMINGHAM, Feb. 26.—Heavy shipments continue to feature the pig iron market and little, if any, iron is being added to producers' stocks. A few inquiries for small tonnages for the second quarter are reported, but furnace interests are not encouraging them. The base prices remain at $16.50 to $17 for No. 2 foundry. Of the 18 furnaces in blast, 10 are on foundry, seven on basic and one on recarburizing iron.

Prices per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	$16.50 to $17.00
No. 1 fdy., 2.25 to 2.75 sil.	17.00 to 17.50
Basic	16.50

Finished Steel.—An advance of $2 a ton has been made on sheets, applying to all orders not under contract. This follows an advance of $1 a ton on bars, plates and shapes reported last week. All lines are reported strong. New business this month has been ahead of that in January and better than that of February, last year. Inquiries for railroad accessories have gained during the past 10 days. Specifications against contracts are good. Last week's fabricated structural steel lettings were light following the heavy lettings of the previous week. Inquiries are strong for plate work. Bar manufacturers are booking a normal amount of small-lot orders.

Cast Iron Pipe.—Demand has been held in check somewhat by weather conditions during the past week. Plants in the district have booked a few fair-sized orders for Pacific Coast cities. Feelers for spring business are developing. Shipments have been slower in the past 10 days. Prices remain at $37 to $38 on 6-in. and larger sizes.

Coke.—Foundry and domestic coke markets are quite active, and the current production of commercial ovens is moving to the trade. More coke is being shipped outside the district than a year ago. Quotations continue firm at $5.

Old Material.—Shipments are small and demand is light. Dealers are inclined to believe it a temporary lull, caused largely to overstocking by more important consumers. Quotations are unchanged, but there is evidence of weakness in nearly all lines.

Prices per gross ton, deliv'd Birmingham dist. consumers' yards:

Heavy melting steel	$12.50
Scrap steel rails	$12.00 to 12.50
Short shoveling turnings	9.00
Cast iron borings	8.00
Stove plate	13.50
Steel axles	20.00
Iron axles	22.00
No. 1 railroad wrought	10.00 to 10.50
Rails for rolling	14.00 to 15.00
No. 1 cast	15.00
Tramcar wheels	13.00 to 14.00
Cast iron carwheels	13.00 to 13.50
Cast iron borings, chem.	13.50 to 14.00

Youngstown

Prices of Billets, Slabs and Sheet Bars Advanced $1

YOUNGSTOWN, Feb. 26.—The two leading local manufacturers of sheets, as of Feb. 21, advanced all common finishes $2 a ton to 2.95c., base, for black, 3.70c., base, for galvanized and 2.20c., base, for blue annealed, all f.o.b. Pittsburgh, and 10c. per 100 lb. higher, f.o.b. Gary. Neither company has sheet-making capacity in the Chicago district, but on business originating in that territory the Gary basing is used. Automobile body sheets remain at 4.10c., base Pittsburgh. The usual spread between common black and automobile body sheets is $1.25 per 100 lb., but in this latest price revision it drops to $1.15, although reports of sales indicate that the demand has been and still is stronger for the body sheets than for common black sheets. Evidently, producing costs of body sheets have responded to economies introduced by manufacturers, or the latter believe that an advance in prices at this juncture might interrupt the flow of orders.

The higher prices on common sheets are to apply on new business for delivery over the remainder of this quarter, but makers generally regard them more as second quarter quotations, as there are few buyers who are not under cover for this quarter.

Steel ingot production of the district, although off somewhat from the high point of January, is several points higher than at this time last year, when the rate was about 75 per cent of capacity. Bessemer steel output is low on account of the moderate

demand for welded pipe, but open-hearth furnaces are pretty heavily taxed in getting out steel as rapidly and in the volume required to meet the demand for sheets, strips and bars. Strip mills in this district are booked well through March and the demand for steel for that use is not only large but insistent. Non-integrated mills are making heavy demands for semi-finished steel. Few companies have any semi-finished steel to sell, but if they had, they could readily obtain higher prices, and this situation has prompted the advance, announced late last week, of $1 a ton, bringing billets and slabs to $34 and sheet bars to $35.

Local producers are interested in an inquiry for 3000 to 5000 tons of basic iron from a Pittsburgh maker of fine steels. The pig iron market in general is slow in point of fresh demands, but there is a good movement from Valley furnaces on old orders. Prices are steady, chiefly because they are practically at producing costs and makers are not pressing sales.

The scrap market here reflects the weaker situation at Pittsburgh and the fact that local demands are less urgent than they were a short time ago. On No. 1 heavy melting steel, prices range from $18 to $18.50. Machine shop turnings are quotable at $11. Compressed sheets are not readily salable at more than $17.50. A recent sale of No. 1 cupola cast scrap was at $16.50, but it is doubtful if as much could be obtained today.

St. Louis

Pig Iron Shipments Heavy But Melters Are Slow in Covering for Second Quarter—Scrap Weaker

ST. LOUIS, Feb. 26.—While melters are pressing for shipments of pig iron and the melt in the district continues heavy, buying for second quarter is light. Sales of the St. Louis Gas & Coke Corporation for the week totaled about 4500 tons, all but 200 tons of which was for second quarter. Sales included 1000 tons to an Iowa wheel manufacturer, 1000 tons to an equipment maker in Illinois and 300 tons of malleable to an Iowa melter. Shipments of the local maker continue to exceed the production of two furnaces. Much iron is still being purchased for second quarter, but melters are proceeding slowly in placing their orders for this delivery. The market is firm at unchanged prices.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill.	$20.00
Malleable, f.o.b. Granite City	20.50
N'th'n No. 2 fdy., deliv'd St. Louis	22.16
Southern No. 2 fdy., deliv'd	20.92
Northern malleable, deliv'd	22.16
Northern basic, deliv'd	22.16

Freight rates: 75c. (average) Granite City to St. Louis; $2.16 from Chicago; $4.42 from Birmingham.

Coke.—The demand from Detroit and other Northern cities for domestic grades of coke continues heavy and is said to exceed the supply. Buying of furnace coke is active, and there is a shortage of foundry grades.

Finished Iron and Steel.—The St. Louis Southwestern Railway Co. has purchased 2500 tons of 85-lb. rails and the necessary splice bars and bolts from the Inland Steel Co. Good business is reported in plates, shapes and bars and the sheet market is said to be strong. The demand from the oil fields picked up considerably in January, but slumped in February, due to the drop in price of crude oil, adversely affecting warehouse business. Structural fabricators report conditions quiet.

Old Material.—The market for old material shows further signs of weakness, due to lower prices in other markets and a freer movement of scrap into this district. There also is said to be no urgent demand for material by the mills. Declines are from 25c. to 50c. a ton. A good demand is reported for relaying rails, mostly for 80 to 90-lb. weights. Railroad lists are as follows: Nickel Plate, and Missouri-Kansas-Texas, each 650 tons, and Mobile & Ohio, 450 tons.

Dealers' buying prices, per gross ton, f.o.b. St. Louis district:

No. 1 heavy melting or shoveling steel	$14.00 to $14.50
No. 2 heavy melting or shoveling steel	13.25 to 13.75
No. 1 locomotive tires	15.00 to 15.50
Miscel. stand.-sec. rails including frogs, switches and guards, cut apart	15.50 to 16.00
Railroad springs	17.25 to 17.75
Bundled sheets	10.00 to 10.50
No. 2 railroad wrought	14.00 to 14.50
No. 1 busheling	10.25 to 10.75
Cast iron borings and shoveling turnings	9.75 to 10.25
Iron rails	15.00 to 15.50
Rails for rolling	16.50 to 17.00
Machine shop turnings	10.00 to 10.50
Heavy turnings	10.00 to 10.50
Steel car axles	20.50 to 21.00
Iron car axles	28.00 to 28.50
Wrot. iron bars and trans.	21.50 to 22.00
No. 1 railroad wrought	15.00 to 15.50
Steel rails, less than 3 ft.	17.00 to 17.50
Steel angle bars	15.00 to 15.50
Cast iron carwheels	15.50 to 16.00
No. 1 machinery cast	16.00 to 16.50
Railroad malleable	17.00 to 17.50
No. 1 railroad cast	15.00 to 15.50
Stove plate	13.75 to 14.25
Agricult. malleable	14.00 to 14.50
Relay. rails, 60 lb. and under	20.50 to 23.50
Relay. rails, 70 lb. and over	26.50 to 29.00

Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.15c.
Cold-fin. rounds, shafting, screw stock	3.75c.
Black sheets (No. 24)	4.10c.
Galv. sheets (No. 24)	4.95c.
Blue ann'l'd sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	4.15c.
Galv. corrug. sheets	5.00c.
Structural rivets	3.75c.
Boiler rivets	3.75c.
	Per Cent Off List
Tank rivets, 7/8-in. and smaller, 100 lb. or more	65
Less than 100 lb	60
Machine bolts	60
Carriage bolts	60
Lag screws	60
Hot-press. nuts, sq., blank or tapped, 200 lb. or more	60
Less than 200 lb	50
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	60
Less than 200 lb	50

Detroit

Manufacturing Operations Rapidly Increasing—Packard Building Addition for Airplane Engines

DETROIT, Feb. 26.—Industrial activity generally through this section is well ahead of that at this time in 1928. A long stretch of cold weather and high money rates are perhaps responsible for a slight decrease in the amount of extension and repair construction work in the industrial field. However, manufacturing operations are rapidly increasing. Heavier production in the automotive industry is getting under way. Stove and heater manufacturers are lagging behind the general trend. Copper and farm implement manufacturers are running on heavy schedules. Employment is increasing steadily, and the automotive industry in March should set a new all-time record for production.

Ford production is running approximately 7200 units a day. February shipments of the Hudson Motor Car Co. should run at least 37,000. This company has begun operating on its maximum spring schedule of 1500 Essex and 400 Hudson cars per day, which incidentally is the largest production schedule in the company's history. About 24,000 men are on the payroll, with various departments working two and three shifts a day in the supply of parts. The body plant is turning out about 1600 bodies a day.

It is understood that February will set a new record for production of Dodge Brothers cars and trucks, and it is stated that production schedules for both March and April are being revised upward.

The Oakland Motor Car Co. is showing daily outputs of between 1200 and 1300 cars, about 1000 of which are Pontiacs. The January production of this company was 17,414.

A contract recently let by the Packard Motor Car Co. for a $650,000 plant addition calls for completion in six weeks. The new plant will accommodate the new Diesel engine manufacturing operations and will have a production of 500 engines a month by the end of the first half of 1929. The Packard Motor Car Co. will limit its participation in the airplane industry to power units.

The March schedule for the new Plymouth model of the Chrysler Corporation has been tentatively set at 650 per day, which represents a considerable increase over present daily outputs. The DeSoto production of the same company is running about 7000 a month.

The Reo Motor Car Co. is setting a new production record for February with shipments thus far substantially ahead of those a year ago.

Present appearances indicate that the Murray Corporation of America will double or treble its 1928 rate of production during the first half of 1929, while orders already booked for the last half of 1929 call for outputs of approximately 1500 units a day. The 1928 peak was 500 units a day.

Further weakness in the old material market in this district has developed during the past week. Heavy melting steel and shoveling steel borings and short turnings have declined 25c. per ton. Long turnings, hydraulic compressed scrap and flashings are 50c. per ton lower. These declines may have been influenced by some quiet direct sales involving considerable tonnage.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov. steel	$14.50 to $15.00
Borings and short turnings	9.25 to 9.75
Long turnings	8.00 to 8.50
No. 1 machinery cast	14.00 to 15.00
Automobile cast	20.00 to 21.00
Hydraul. comp. sheets	14.25 to 14.75
Stove plate	11.00 to 12.00
No. 1 busheling	11.00 to 11.50
Sheet clippings	9.00 to 9.50
Flashings	12.50 to 13.00

Cincinnati

Pig Iron Sales Total 7500 Tons and Melt Is Heavy—Sheet Mills Operating at High Rate

CINCINNATI, Feb. 26.—Local dealers sold about 7500 tons of pig iron the past week. Inquiries for second quarter are more numerous and indications are that bookings during the next few weeks will show a considerable gain. The foundry melt in this district has been good, and there is little likelihood that there will be much first quarter contract iron undelivered by March 31. Prices are fairly firm, although shading of quotations is noted in some cases. Producers in the Chicago district are said to be naming $18.50, furnace, with 25c. added for silicon differentials on pending business in Indiana. Valley makers are quoting $17.50, furnace, in Indiana and in western Ohio and in the past week have taken 500 tons of Northern foundry at Lima, Ohio, and 400 tons in Cincinnati. An Ohio River furnace is reported to be quoting low delivered prices to river points. Northern Ohio iron is selling at $18.50 to $19, base furnace, and Southern iron at $16.50, Birmingham. Silvery iron is quiet but steady at $26 for 8 per cent. Sales include 600 tons for an Indiana melter.

Prices per gross ton, deliv'd Cincinnati:

So. Ohio fdy., sil. 1.75 to 2.25	$20.39 to $20.89
Ala. fdy., sil. 1.75 to 2.25	20.19 to 20.69
Ala. fdy., sil. 2.25 to 2.75	20.69 to 21.19
Tenn. fdy., sil. 1.75 to 2.25	20.19
S'th'n Ohio silvery, 8 per cent	27.89 to 28.89

Freight rates, $1.89 from Ironton and Jackson, Ohio; $3.69 from Birmingham.

Coke.—For delivery in southern Ohio, by-product foundry coke will be advanced 50c. a ton to $7.50, ovens, on March 1. However, the schedule in Indiana is likely to remain undisturbed. At Detroit, by-product foundry coke for local delivery and for shipment to eastern Michigan points is up 50c. a ton and now is quoted at $9, ovens, but in western Michigan the delivered price of $10 will be unchanged. By-product domestic coke will continue at the present price. The movement of by-product foundry and domestic in February was heavier than in January.

Old Material.—Buying by consumers has been in lessened volume, and the market is developing weakness. Steel plants have abundant stocks and there probably will be few purchases for forward delivery until these have been substantially reduced. Blast furnace grades and machine shop turnings are especially quiet.

Finished Material.—Bookings of district sheet mills continue to exceed output, with the result that the leading producer has accumulated the largest unrolled tonnage in its history. Operations are being maintained at nearly 100 per cent of capacity and every effort is being made to push production to a new high level to fill current orders. The price situation is satisfactory.

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel	$13.75 to $14.25
Scrap rails for melting	13.75 to 14.25
Loose sheet clippings	10.00 to 10.50
Bundled sheets	11.00 to 11.50
Cast iron borings	10.00 to 10.50
Machine shop turnings	9.50 to 10.00
No. 1 busheling	11.00 to 11.50
No. 2 busheling	7.50 to 8.00
Rails for rolling	14.50 to 15.00
No. 1 locomotive tires	14.25 to 14.75
No. 2 railroad wrought	13.75 to 14.25
Short rails	18.50 to 19.00
Cast iron carwheels	12.75 to 13.25
No. 1 machinery cast	19.25 to 19.75
No. 1 railroad cast	15.25 to 15.75
Burnt cast	10.50 to 11.00
Stove plate	10.50 to 11.00
Brake shoes	10.50 to 11.00
Railroad malleable	15.25 to 15.75
Agricultural malleable	14.25 to 14.75

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and struc. shapes	3.40c.
Bars, soft steel or iron	3.30c.
New billet reinforc. bars	3.15c.
Rail steel reinforc. bars	3.00c.
Hoops	4.05c.
Bands	3.50c.
Cold-fin. rounds and hex	3.85c.
Squares	4.35c.
Black sheets (No. 24)	3.90c.
Galvanized sheets (No. 24)	4.75c.
Blue ann'l'd sheets (No. 10)	3.45c.
Structural rivets	3.85c.
Small rivets	65 per cent off list
No. 9 ann'l'd wire, per 100 lb	$3.00
Com. wire nails, base per keg	2.95
Cement c't'd nails, base 100 lb. keg	2.95
Chain, per 100 lb	7.55
	Net per 100 Ft.
Lap-weld. steel boiler tubes, 2-in.	$16.00
4-in.	33.00
Seamless steel boiler tubes, 2-in.	17.00
4-in.	34.00

Anaconda Organizes Wire Making Subsidiary

The Anaconda Wire & Cable Co. has been organized by the Anaconda Copper Mining Co., 25 Broadway, New York, to take over and operate wire and rod mills of parent company at Great Falls, Mont., and similar mills of the American Brass Co., at Kenosha, Wis. The new company will also purchase the plant and business of the Inland Wire & Cable Co., Sycamore, Ill., and will consolidate it in the new organization.

Lowest Fabricated Plate Orders in 14 Months

WASHINGTON, Feb. 26.—Orders for fabricated steel plates in January totaled 32,724 tons, or 41 per cent of the monthly capacity of the 51 firms reporting to the Department of Commerce, and compared with 40,441 tons, or 50.6 per cent of capacity, in December. January orders, the lowest since November, 1927, were distributed as follows: Oil storage tanks, 11,055 tons; refinery materials and equipment, 6192 tons; tank cars, 1567 tons; gas holders, 2018 tons; blast furnaces, 325 tons; stacks and miscellaneous, 11,567 tons.

Comparisons with January, 1928, and January, 1927, show a loss last month of about 9 per cent. Both of those months reported about 35,800 tons. Orders for refinery materials and equipment last month made the largest total, with one exception, in more than two years.

Starts Milwaukee Mill of Illinois Steel Co.

After several years of spasmodic operation, and having been practically closed down since Jan. 1, the Milwaukee mill of the Illinois Steel Co., reopened on Feb. 19, with a force of 450 workmen, to execute special orders for small railroad rails. These will require something more than a month's work, but additional orders are expected meanwhile. The Milwaukee, (or Bay View) mill is a bar mill and it is now handling the overflow of bar requirements upon the Illinois Steel Co. mills at Chicago, Joliet and Gary.

Non-Ferrous Metal Markets

Copper Very Strong and Higher, Tin Sluggish at Steady Levels, Lead Active, Zinc Dull and Unchanged

THE WEEK'S PRICES. CENTS PER POUND FOR EARLY DELIVERY

	Feb. 26	Feb. 25	Feb. 23	Feb. 21	Feb. 20
Lake copper, New York	18.37½†	18.37½†	18.12½	18.12½	18.12½
Electrolytic copper, N. Y.*	18.25	18.00	17.75	17.75	17.75
Straits tin, spot, N. Y.	48.87½	49.00	....	49.00	49.12½
Lead, New York	6.95	6.95	6.95	6.95	6.95
Lead, St. Louis	6.90	6.90	6.85	6.85	6.85
Zinc, New York	6.70	6.70	6.70	6.70	6.70
Zinc, St. Louis	6.35	6.35	6.35	6.35	6.35

*Refinery quotation: price ¼c. higher delivered in the Connecticut Valley.
†Nominal.

NEW YORK, Feb. 26.

Copper.—More excitement than in many years pervades the copper market. Yesterday electrolytic copper was advanced ¼c. to 18.25c., delivered in the Connecticut Valley. This morning most producers had stopped quoting, having sold their quotas. Late this afternoon another advance was recorded and, before the market closed, the quotation stood at 18.50c., delivered, with practically all companies on that basis, except those not quoting. It is stated that considerable business was done late today at 18.50c. This is the highest price since September, 1920. Today also the price of Copper Exporters, Inc., was advanced to 18.50c., c.i.f. usual European ports, and it is expected that tomorrow the quotation will be 18.75c. A week ago the market was very quiet, but since then heavy demand developed from both foreign and domestic consumers. Melters abroad have been purchasing the red metal, during the last six days, at the rate of about 3000 gross tons per day, bringing total foreign sales for the month to date to at least 60,000 tons. Domestic buying has substantially exceeded this total. The market is in a semi-chaotic state and further advances may easily develop. Domestic buying has included deliveries through June and producers have very little metal available this side of July. No July metal has been booked. Lake copper is nominal at 18.25c. to 18.37½c. One producer is entirely out of the market and is not quoting.

Tin.—Sales of Straits tin for the week ended Feb. 23 were about 700 tons. As noted last week, the most active day was Monday, Feb. 18, when 500 tons changed hands. This leaves only 200 tons sold for the remainder of the week. The holiday on Friday explains this in part. Consumers were the chief buyers, but at present are showing little interest and are evidently waiting for declines in prices. Dealers are almost out of the market. On the National Metal Exchange, business was also very light. Yesterday the market for Straits tin was

Metals from New York Warehouse

Delivered Prices Per Lb.

Tin, Straits pig	51.00c. to 52.00c.
Tin, bar	53.00c. to 54.00c.
Copper, Lake	19.50c.
Copper, electrolytic	19.25c.
Copper, casting	19.00c.
Zinc, slab	7.50c. to 8.00c.
Lead, American pig	7.75c. to 8.25c.
Lead, bar	9.75c. to 10.25c.
Antimony, Asiatic	11.75c. to 12.75c.
Aluminum No. 1 ingots for remelting (guar'nt'd over 99% pure)	25.00c. to 26.00c.
Alum. ingots, No. 12 alloy	24.00c. to 25.00c.
Babbitt metal, commerc'l grade,	30.00c. to 40.00c.
Solder, ½ and ½	32.25c. to 33.25c.

Metals from Cleveland Warehouse

Delivered Prices Per Lb.

Tin, Straits pig	55.00c.
Tin, bar	57.00c.
Copper, Lake	19.38c.
Copper, electrolytic	19.38c.
Copper, casting	18.13c.
Zinc, slab	8.00c.
Lead, American pig	7.75c. to 8.00c.
Lead, bar	10.00c.
Antimony, Asiatic	16.00c.
Babbitt metal, medium grade	19.50c.
Babbitt metal, high grade	59.00c.
Solder, ½ and ½	34.00c.

Rolled Metals from New York or Cleveland Warehouse

Delivered Prices, Base Per Lb.

Sheets—	
High brass	21.87½c. to 22.87½c.
Copper, hot rolled, base sizes	26.62½c. to 27.62½c.
Copper, cold rolled, 14 oz. and heavier, base sizes	28.87½c. to 29.87½c.
Seamless Tubes—	
Brass	26.75c. to 27.75c.
Copper	27.87½c. to 28.87½c.
Brazed Brass Tubes	29.87½c. to 30.87½c.
Brass Rods	19.62½c. to 20.62½c.

From New York Warehouse

Delivered Prices, Base Per Lb.

Zinc sheets (No. 9), casks	10.00c. to 10.50c.
Zinc sheets, open	11.00c. to 11.50c.

Non-Ferrous Rolled Products

Mill prices on all brass products and lead full sheets were advanced ¼c. per lb. on Feb. 25. On the same date seamless copper tubing prices were increased ½c. and other copper products were advanced ⅜c. Zinc sheet prices are unchanged at 9.75c., base.

List Prices, Per Lb., f.o.b. Mill

On Copper and Brass Products, Freight up to 75c. per 100 Lb. Allowed on Shipments of 500 Lb. or Over

Sheets—	
High brass	22.75c.
Copper, hot rolled	27.75c.
Zinc	9.75c.
Lead (full sheets)	10.75c. to 11.00c.
Seamless Tubes—	
High brass	27.62½c.
Copper	28.87½c.
Rods—	
High brass	20.50c.
Naval brass	22.50c.
Wire—	
Copper	20.25c.
High brass	23.25c.
Copper in Rolls	26.75c.
Brazed Brass Tubing	30.75c.

Aluminum Products in Ton Lots

The carload freight rate is allowed to destinations east of Mississippi River and also to St. Louis on shipments to points west of that river.

Sheets, 0 to 10 gage, 3 to 30 in. wide	33.00c.
Tubes, base	42.00c.
Machine rods	54.00c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged customers after the metal has been properly prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	15.25c.	17.00c.
Copper, hvy. and wire	15.00c.	16.75c.
Copper, light and bottoms	13.00c.	14.00c.
Brass, heavy	8.25c.	9.25c.
Brass, light	7.25c.	8.25c.
Hvy. machine composition	12.00c.	13.50c.
No. 1 yel. brass turnings	9.75c.	10.75c.
No. 1 red brass or compos. turnings	11.00c.	11.75c.
Lead, heavy	5.50c.	6.00c.
Lead, tea	4.25c.	4.75c.
Zinc	3.25c.	3.75c.
Sheet aluminum	13.50c.	15.50c.
Cast aluminum	12.00c.	14.00c.

Rolled Metals, f.o.b. Chicago Warehouse

(Prices Cover Trucking to Customers' Doors in City Limits)

Sheets—	Base per Lb.
High brass	22.75c.
Copper, hot rolled	28.00c.
Copper, cold rolled, 14 oz. and heavier	30.25c.
Zinc	10.00c.
Lead, wide	10.55c.
Seamless Tubes—	
Brass	27.62½c.
Copper	28.62½c.
Brass Rods	20.50c.
Brazed Brass Tubes	20.75c.

stagnant and today extreme dullness prevailed, with spot Straits tin quoted at 48.87½c., New York. The London market is also quiet, and quotations today are about £3 per ton lower than a week ago, with spot standard reported at £220 10s., future standard at £222, and spot Straits at £225 10s. per ton. The Singapore market today was £225 2s. 6d.

Lead.—Demand for lead has been exceedingly heavy, particularly yesterday and today, and prices have advanced in the West. Business has been done at 6.90c., St. Louis, with as high as 7c. asked. The leading interest has not yet changed its quotation, which remains at 6.95c., New York, as the contract price. For the first time in many months the New York and outside markets are close to a parity. Sales have included prompt and March delivery, with some for April. One large company in the Middle West reports that its available supplies are nearly all booked for prompt and March metal.

Zinc.—Only moderate demand for prime Western is reported at unchanged quotations, which stand at 6.35c., East St. Louis, or 6.70c., New York, for delivery through May. Ore prices at Joplin are unchanged at $41 per ton. Production last week was 11,500 tons, shipments about 13,300 tons, and sales 13,520 tons. Stocks of ore in producers' bins have been further reduced and are estimated now at only about 18,600 tons.

Antimony.—Owing to the outbreak of hostilities in China, the market is unsteady and information from the district from which antimony is shipped is meager because some of the fighting is in that territory. The market is easier, with Chinese metal quoted at 9.37½c., New York, duty paid, for all positions.

Nickel.—Ingot and shot nickel in wholesale lots are quoted at 35c. and 36c. per lb. respectively. Cathodes of electrolytic nickel are obtainable on the same basis as ingot and shot nickel.

Aluminum.—Virgin metal, 98 to 99 per cent pure, is obtainable at 23.90c. per lb., delivered.

Non-Ferrous Metals at Chicago

CHICAGO, Feb. 26.—Prices are strong and sales are active, except in antimony. Prices are advanced for old metals and sales are reported in good volume.

Prices, per lb., in carload lots: Lake copper, 18.75c.; tin, 49.62½c.; lead, 6.97½c.; zinc, 6.45c.; in-less-than-carload lots: antimony, 10.35c. On old metals we quote copper wire, crucible shapes and copper clips, 14.62½c.; copper bottoms, 13.12½c.; red brass, 12.87½c.; yellow brass, 9.62½c,; lead pipe, 5.62½c.; zinc, 3.62½c.; pewter, No. 1, 27.62½c.; tin foil, 27.62½c.; block tin, 40.12½c.; aluminum, 12.87½c.; all being dealers' prices for less-than-carload lots.

Steel Company Earnings Show Large Gains

THE annual earnings statements of leading steel companies for 1928 continue to reflect the increased prosperity of the industry last year as compared with 1927. In many cases the 1927 showing has been practically doubled.

The Central Alloy Steel Corporation, Massillon, Ohio, had net earnings of $4,903,340 in 1928, as compared with $2,725,656 in 1927, and equivalent to $3.24 per share of common stock, or an increase of 107 per cent over 1927. During the year $3,320,410 was expended on repairs and maintenance, all of which was taken from earnings, and $2,137,970 for new construction. The economies that were expected to result from the merger of the United Alloy Steel Corporation, the Central Steel Co., and the Central Furnace Co., in 1926 were largely realized last year, according to Frederick J. Griffiths, chairman, in his annual report. He stated that while the average selling price per net ton of the company's products declined 7.9 per cent last year as compared with 1927, the average cost per net ton was reduced 9.6 per cent for the same period mainly from economies resulting from the merger.

The American Rolling Mill Co., Middletown, Ohio, which has also been considerably enlarged by acquisitions and expansion in the last two years, also reported greatly increased net earnings, the total for 1928 having amounted to $6,675,034, as compared with $3,748,565 in 1927. According to President George M. Verity the business of this company moved in more even volume during the entire 12 months of 1928 than it has in any similar period since the war. "Price structures," said Mr. Verity, "are now better stabilized than they have been at any time during the past six years, but due to the steady decline that has taken place, they are lower than should be consistent with quality service demanded and capital invested."

Profits of the Interstate Iron & Steel Co., Chicago, amounted to $1,023,869 in 1928, as against $409,784 in the preceding year. This company also anticipates very heavy operating schedules during the remainder of the first quarter.

Spang, Chalfant & Co., Inc., Pittsburgh, which early in the past year purchased the Standard Steamless Tube Co., Pittsburgh, in order to add seamless tubular products to its line of welded steel pipe, had profits of $3,226,188 in 1928, as compared with $3,126,532 in 1927.

The Weirton Steel Co., Weirton, W. Va., the annual profits of which have never before been made public, earned approximately $6,869,000 in 1928, after charges for bond interest, depreciation and Federal taxes. It was also indicated by this company, that although 1928 earnings were very satisfactory, they failed to reflect the betterment in prices which has occurred since the end of the year.

Among the large makers of pig iron, the M. A. Hanna Co., Cleveland, more than doubled its 1927 earnings in 1928, reporting profits of $2,231,221 in the past year as compared with $1,112,957 in 1927. The report was considerably better than any other since the company was reorganized in its present form.

The improved conditions of the steel industry in 1928 were also reflected in the earnings of the Youngstown Sheet & Tube Co., Youngstown, which amounted to $10,446,336, equivalent to $9.53 per share of common stock. In 1927 the company earned $7,023,334 or $6.11 a share on the slightly smaller number of common shares outstanding at that time.

To Focus on Eliminating Waste in Industry

April has been set apart as "Management Month" by the American Society of Mechanical Engineers.

The arrangement means that throughout the local sections of the society a special attempt will be made to focus on a management subject in April meetings. In particular this year the topics will be made to revolve about waste elimination. A drive of the kind was put into effect in 1926 by the Westinghouse Electric & Mfg. Co. The company at that time included exhibits in every department showing wastes actually occurring. The result was at a saving of $50,000 a year. In 1927 a similar method was followed by the Newport News Shipbuilding & Dry Dock Co., with a saving estimated at $250,000.

Simplification of Hack-Saw Blades

Simplified practice recommendation R90-28 of the United States Department of Commerce deals with hack-saw blades for both hand frames and power use. The simplified list of sizes shown in the pamphlet represents the elimination of about 75 per cent of what previously had been manufactured. Under the hand blades, which are flexible, the list now comprises 14 sizes in four lengths. Under the power blades there are now 24 sizes in six lengths.

The Endicott Forging & Mfg. Co., Endicott, N. Y., is installing a hardening and drawing unit for handling small pieces and a car type annealing furnace, both of which are to be built by the George J. Hagan Co., Pittsburgh.

Pulaski Iron Co., Pulaski, Va., has removed its Philadelphia office to 1101 Union Bank Building, 1518 Walnut Street.

Fabricated Structural Steel

Awards of 33,450 Tons—Many Large New Projects in Pending Work Calling for 66,600 Tons

WITH 12,000 tons for a New York bank building, 10,000 tons for an office building in Philadelphia, 10,000 tons for a mining company in Canada and 9000 tons of plates for two gas holders at San Francisco, new projects brought out during the week totaled 66,600 tons. Awards of 33,450 tons included 6000 tons for a bridge in Chicago and 5700 tons and 4200 tons respectively for two New York office buildings. Awards follow:

BOSTON, 500 tons, Brighton high school, to Boston Bridge Works, Inc.

QUINCY, MASS., 273 tons, stores, to A. Piotti Co.

NEW YORK, 5700 tons, office building at 1441 Broadway, to Hay Foundry & Iron Works.

NEW YORK, 4200 tons, Lefcourt office building at Madison Avenue and Forty-first Street, to A. E. Norton, Inc.

ALBANY, N. Y., 1800 tons, telephone building, to Levering & Garrigues Co.

LEHIGH VALLEY RAILROAD, 300 tons, bridge, to Bethlehem Steel Co.

PHILADELPHIA, 350 tons, office building in Seventeenth Street, to American Bridge Co.

BALTIMORE, 1550 tons, airplane plant for Glenn L. Martin Co., to McClintic-Marshall Co.

MONROE, MICH., 800 tons, building for Consolidated Paper Co., to Whitehead & Kales Co.

TORONTO, ONT., 100 tons, factory for Canadian Wirebound Boxes, Ltd., to Dominion Bridge Co.

EAST CLEVELAND, OHIO, 700 tons, junior high school, to National Iron & Wire Co.

CLEVELAND, 1580 tons, three bridges for Nickel Plate Railroad, to Mount Vernon Bridge Co.

FORT WAYNE, IND., 400 tons, building for International Harvester Co., to McClintic-Marshall Co.

SOUTH CHICAGO, ILL., 100 tons, building for Wisconsin Steel Co., to Vierling Steel Works, local.

CHICAGO, 200 tons, for Grigsby-Grunow Co., to Hansell-Elcock Co., local.

CHICAGO, 1600 tons, Atheneum building, to Gage Structural Steel Co.

CHICAGO, 6000 tons, Damon Avenue bridge, to an unnamed bidder.

DULUTH, MINN., 1400 tons, bridge, to Kansas City Bridge Co.

HASTINGS, MINN., 900 tons, dam, to Minneapolis Steel & Machinery Co.

INTERNATIONAL, UTAH, 500 tons, building for Anaconda Copper Mining Co., to Minneapolis Steel & Machinery Co.

DENVER, 1515 tons plates, 60-in. pipe for Denver Board of Water Commissioners, to Lock-Joint Pipe Co.

BEVERLY HILLS, CAL., 687 tons, California Bank building, to Consolidated Steel Corporation.

LOS ANGELES, 350 tons, club house at Sixth and Los Angeles Streets, to McClintic-Marshall Co.

LONG BEACH, CAL., 1936 tons sheet piling, to Steel Inc., which will furnish German material.

Structural Projects Pending

Inquiries for fabricated steel work include the following:

NEW YORK, 12,000 tons, office building at 1 Wall Street for Irving Trust Co.

NEW YORK, 5000 tons, Pierre Hotel at Fifth Avenue and Sixty-first Street; George A. Fuller Co., general contractor.

NEW YORK, 2000 tons, office building for *Herald Tribune* in West Forty-first Street.

UTICA, N. Y., 100 tons, city bridge.

NEWARK, N. J., 175 tons, State highway bridge.

PENNSYLVANIA RAILROAD, 100 tons, bridge at Philadelphia.

PHILADELPHIA, 10,000 tons, Pennsylvania Building, Sixteenth Street; Bethlehem Steel Co., low bidder.

PHILADELPHIA, 550 tons, North Broad Street Bank building; Nelson Pedley, general contractor.

CAMDEN, N. J., 1000 tons, building for Arundel Mfg. Co.; H. K. Ferguson Co., New York, engineer.

WILMINGTON, DEL., 6000 tons, floating airport for Armstrong Seadrome Development Co., Wilmington; Henry J. Gielow, Inc., 25 West Forty-fifth Street, New York, architect.

BALTIMORE, 5000 tons, plant for Western Electric Co.

HUNTINGTON, W. VA., 8000 tons, shops for Chesapeake & Ohio Railway Co. at Huntington and Russell, Ky.; reported last week as 6000 tons, general contract awarded.

SAN ANTONIO, TEX., 2200 tons, professional and garage building.

SAN ANTONIO, 800 tons, Alamo National Bank Building.

DETROIT, 1400 tons, building for Produce Terminal Co.

FLIN FLON, CANADA, 10,000 tons, buildings for Flin Flon Gold Mining Co.

TORONTO, ONT., 350 tons, Board of Education, for Parkdale Collegiate Institute.

OAK PARK, ILL., 750 tons, building for Marshall Field & Co.

CHICAGO, 2000 tons, mill building for Inland Steel Co.

UPLAND, CAL., 120 tons, plates, 42 to 16-in. welded steel pipe; Los Angeles Mfg. Co., low bidder.

SAN FRANCISCO, 9000 tons, plates, one 10,000,000 and one 8,000,000 cu. ft. gas holder for Pacific Gas & Electric Co.; bids being taken.

OAKLAND, CAL., 700 tons, Medical Building; Pacific Coast Engineering Co., low bidder.

SACRAMENTO, CAL., 225 tons, bridge over Mad River; bids March 13.

PORTLAND, ORE., 105 tons, bridge over Malheur River; bids March 8.

Obituary

EDWARD LUPTON, president of the David Lupton's Sons Co., Philadelphia, maker of steel windows and shelving products, died at his home in that city on Feb. 21. He was born in England 63 years ago, but came to this country when he was four years of age and early in life became identified with the business of which he was later president. He served as an apprentice in the Lupton company and also studied architectural drafting and stone engraving. He became a partner in the Lupton firm in 1892 and was elected president in 1902, having held that position until his death. He was a life president of the National Association of Ornamental Iron and Bronze Manufacturers and had also served as president of the Builders' Exchange of Philadelphia.

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HOMER F. ELWELL, owner of the Elwell Iron Works, Springfield, Mass., died at his home in that city on Feb. 23, aged 58 years.

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WILLIAM F. GIBBONS, vice-president Cleveland Hardware Co., Cleveland, died suddenly, Feb. 20, at St. Petersburg, Fla.

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WALTER D. UPTEGRAFF, former president of the Union Switch & Signal Co., Swissvale, Pa., and chairman of the board of directors of the Westinghouse Air Brake Co., Wilmerding, Pa., died at Niagara Falls, N. Y., on Feb. 17, aged 65 years. He was long associated with the late George Westinghouse and in 1916 became his financial and business agent. He was elected president of the Switch & Signal company in 1915 and when it was absorbed by the Air Brake company he became chairman of the board of the latter. In recent years he had been active in the paper business, having founded the Pittsburgh Wall Paper Co., New Brighton, Pa., and the Defiance Paper Co., Niagara Falls.

Large Increase in Developed Water-Power

Water-power development in the United States in 1928 provided an increase of 1,275,530 hp., or 10.4 per cent on that existing at the beginning of the year. The total on Jan. 1, 1929, is given by the United States Geological Survey at 13,571,530 hp. The increase in 1928 was the largest ever made within such a period. It compares with only 575,000 hp. in the preceding year. The increases in 1925 and in 1924, however, were at a higher percentage rate than last year, although the totals were less. In 1924, with a gain of 950,000 hp., the rate was 10.5 per cent. From March, 1925, to Jan. 1, 1926, there was a gain of 1,139,000 hp., or 11.3 per cent, which is at the rate of about 14 per cent in a year. The present total is more than 80 per cent greater than the 7,927,000 hp. reported for November, 1921.

Of the present total the public utility and municipal plants account for 11,886,336 hp., or 87½ per cent. The remaining 1,685,194 hp. is in manufacturing and miscellaneous plants. As the public utility and municipal plants number 1605, their average capacity works out at 7400 hp. The other plants are more numerous, numbering 1770, but the average hp. is only 950.

PERSONAL

A. W. CUTTEN has resigned as a director of the Baldwin Locomotive Works, Philadelphia, and R. P. LAMONT, president American Steel Foundries, Chicago, has been named to succeed him. The Steel Foundries company recently became associated with the Baldwin organization in forming the General Steel Castings Co., which is erecting a large plant near the Baldwin property at Eddystone, Pa.

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WILLIAM M. PATTERSON has been elected president, and RICHARD T. FRICK, first vice-president, of the Frick-Reid Supply Corporation, Pittsburgh.

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E. H. WOOD, 220 Delaware Avenue, Buffalo, and CHARLES E. DAVIS, 888 Arcade, Cleveland, have been appointed representatives in their respective territories for the stamping, forming and pressed metal contract department of the Geuder, Paeschke & Frey Co., Milwaukee.

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LLOYD B. JONES, recently assistant to the purchasing agent of the Bethlehem Fabricators, Inc., Bethlehem, Pa., has been appointed purchasing agent of the Bethlehem Construction Co., Bethlehem, engineer and fabricator of structural steel.

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J. R. SHEPPARD, chief engineer in charge of hydraulic machinery for R. D. Wood & Co., Philadelpia, has resigned to become associated in a sales engineering capacity with the Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. His identification with the Wood company has covered a period of 15 years, during which time he has made a comprehensive study of hydraulic machinery and equipment.

—

GEORGE JAMIESON, president of A. H. Fox & Co., Seattle, Wash., is temporary president of an association of equipment dealers which has been formed at Seattle.

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KARL H. MARSH, chief engineer at the Buffalo plant of the Wickwire Spencer Steel Co., Inc., New York, has resigned to become identified in a similar capacity with the British Empire Steel Corporation, with headquarters at Sydney, N. S. He served as chief engineer of the Dominion Steel Corporation, a subsidiary of the British Empire company, from 1919 to 1923.

—

LEONARD J. BUCK, president of Leonard J. Buck, Inc., 74 Trinity Place, New York, importer and supplier of ores and raw materials for the iron and steel industries, has been elected a director of "Amstea" Société Anonyme, Paris, France. Mr. Buck's firm is American representative of Amstea for the export to Europe of American iron and steel products.

FRANK S. O'NEILL, Indianapolis plant manager for the Link-Belt Co., Chicago, has been elected president of the Indianapolis Foundrymen's Association. GUY E. STREET, American Foundry Co., vice-president; JAMES H. HOOKER, Sinker-Davis Co., treasurer, and ANDREW J. ALLEN, secretary, continue in the same capacities.

—

KARL HERMANN, consulting engineer for the Studebaker Corporation, South Bend, Ind., has purchased a controlling interest in the Bantam Ball Bearing Co., with plants at Bantam, Conn., and South Bend, and will consolidate the operations of both plants at South Bend.

—

J. S. SPROTT, for the last eight years vice-president in charge of sales for the General Fireproofing Co., Youngstown, on March 1 will become general manager of sales for the

J. S. SPROTT

Berger Mfg. Co., Canton, Ohio, fabricator of sheet steel products including metal ceilings, furniture, lumber and other materials. The company is a subsidiary of the Central Alloy Steel Corporation, Massillon, Ohio. Mr. Sprott was graduated in civil engineering at Purdue University and has been engaged in sales work since 1913.

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CLARENCE E. MANGE, president Missouri Chromium Plating Co., St. Louis, spoke on chromium plating at a meeting of the St. Louis chapter of the American Society for Steel Treating on Feb. 15.

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D. M. HOUSTON, foundry engineer for the International Nickel Co., New York, was the speaker at a meeting of the New Haven, Conn., chapter of the American Society for Steel Treating, held at Bridgeport, Conn., on Feb. 20. His subject was "Nickel Chromium Alloys in Gray Iron."

F. E. BAUER, JR., has been appointed export sales manager for the American Hoist & Derrick Co., St. Paul, Minn., and will have headquarters at 50 Church Street, New York. He has represented the company in foreign fields for many years.

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H. P. ACKERMAN, for the last five years Eastern district sales manager for the Homestead Valve Mfg. Co., Coraopolis, Pa., has organized a manufacturers' agency to be known as the Steam Specialty Sales Co., with headquarters at 908 West Trade Street, Charlotte, N. C. The company will handle a complete line of Homestead valves in North and South Carolina and a part of Georgia.

—

GEORGE F. DAVIE, vice-president and treasurer Interstate Iron & Steel Co., Chicago, will return next week from a four weeks' vacation in New Orleans and Texas.

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P. A. NEWTON, general superintendent South Works, Illinois Steel Co., will sail this week for a month's stay in the West Indies.

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GEORGE TYSON, who has been identified with the Reading, Pa., district office of the Reading Iron Co., Reading, has been placed in charge of a new district sales office which that company has established at 1216 Hibernia Bank Building, New Orleans.

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WILLIAM C. POTTER, president Guaranty Trust Co., New York, who will be president of the consolidated company which is to be formed by a merger of the Guaranty Trust Co. and the National Bank of Commerce, New York, received his college training as a mining engineer and for 15 years was active in mining and metallurgical developments in this country and Mexico. He was graduated at the Massachusetts Institute of Technology in 1897. He first became identified with the Guaranty Trust Co. in 1912, but left the company in 1916 to become a partner in Guggenheim Brothers. During the war he served as chief of the equipment division, Aviation Corps, United States Army. He became chairman of the Guaranty company early in 1921 and was elected president later in that year. He is a member of the American Institute of Mining and Metallurgical Engineers.

—

P. N. GUTHRIE, JR., vice-president Reading Iron Co., Reading, Pa., spoke at the convention of the Eastern Supply Association held at the Hotel Astor, New York, on Feb. 14. He announced the establishment of the company's resale policy which is to become effective March 1.

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W. J. LYMAN has been appointed manager of Southern sales for the National Cast Iron Pipe Co., with headquarters at Birmingham. He formerly was sales manager for the Birmingham Machine & Foundry Co., Birmingham.

R. R. BAXTER, assistant to the vice-president of the Tennessee Coal, Iron & Railroad Co., Birmingham, has been named general superintendent of the company's Fairfield steel works, Fairfield, Ala., succeeding W. H. OLDHAM, who recently resigned to become Southern manager of the Republic Iron & Steel Co. A. B. HASWELL, chief engineer, has been named to succeed Mr. Baxter and R. D. OSGOOD has been promoted from assistant chief engineer to chief engineer.

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J. E. WATSON and J. I. THOMPSON have been elected directors of the Pittsburgh Die Casting Corporation. Mr. Watson also has been named secretary of the corporation. He is vice-president and general manager of the Elliott Co., Jeannette, Pa., and Mr. Thompson is a vice-president of the Koppers Co., Pittsburgh.

—

GEORGE BARTOL, vice-president of the Otis Steel Co., Cleveland, completed his fiftieth year in the steel industry last week and was honored by the board of directors of that company on Feb. 21, by the presentation of a platinum watch and testimonial resolution. He started with the company in 1879 as a chemist.

—

H. H. WOOD, formerly chief engineer of the Laclede Steel Co., St. Louis, has joined the industrial department of the Timken Roller Bearing Co., Canton, Ohio, and will specialize in the application of Timken bearings to steel mill equipment of various sorts. At present his headquarters will be in Canton.

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H. L. MCKINNON, C. O. Bartlett & Snow Co., Cleveland, spoke at the February meeting of the Quad-City Foundrymen's Association, his subject having been "Modern Production Methods in the Foundry."

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ALBERT E. GROVER, cost consultant for the National Machine Tool Builders Association, Cleveland, was the guest of the New England branch on Feb. 19, at the Hotel Bancroft, Worcester, Mass.

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GEORGE L. GAYLORD, president of the Westfield Grinding Wheel Co., Westfield, Mass., has been made president of the Westfield Chamber of Commerce.

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CARL S. NEUMANN has been made president of the Union Mfg. Co., New Britain, Conn., succeeding ALBERT F. CORBIN, who has resigned after holding the position for 21 years.

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J. E. PERRY, manager of the North works, American Steel & Wire Co., Worcester, Mass.; C. F. HOOD, assistant manager of the company's North works, and H. W. JONES, superintendent of the New Haven, Conn., works were speakers at the annual banquet of the Fairweather Club of the company's Worcester plants on Feb. 19.

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W. S. THOMSON, chief engineer Kalman Steel Co., Chicago, will speak on "Engineering Costs" at the fifth annual meeting of the Concrete Reinforcing Steel Institute, to be held at Kenilworth Inn, Asheville, N. C., April 15 to 17. W. D. M. ALLEN, manager of the cement products bureau of the Portland Cement Association, will speak on "New Markets for Reinforcing Steel."

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ADDISON MCGARRETT, formerly associated with the Niles Tool Works Co., Hamilton, Ohio, has become identified with the Pratt & Whitney Co., Hartford, Conn., as manager of the newly created agency sales department. He was with the Niles company for more than 25 years, for 15 years as traveling representative in New England, New York and Ohio, and for five years as manager of the Rochester, N. Y., office. ROBERT P. BRINKMAN, who assisted Mr. McGarrett at Hamilton, is also associated with him at Hartford.

ARTHUR PURNELL

Recently appointed Chicago district agent for the Youngstown Sheet & Tube Co.

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THOMAS M. SMALL has been placed in charge of the sales and service activities in the New York territory of the Autosan dish and silver cleaning machinery division of the Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. His headquarters will be at the company's New York office, 20 Vesey Street, and his territory will include New Jersey, Philadelphia and Washington. Mr. Small will be assisted by RUSSELL CHICO. The company's sales and service activities for the Autosan line in the Cleveland district have been placed in the hands of H. A. SEIFERMAN. His territory will embrace cities as far East as Buffalo and Rochester and other places formerly covered by the Chicago office.

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HARRY DOBSON, formerly superintendent of the London, Ont., and Montreal branches of the Ford Motor Co. of Canada, and latterly with the White Motor Co. and the Chrysler Corporation, has joined the staff of the Arthur Jackson Machine Tool Co., Toronto, and will manage the new branch this company is about to open at Windsor, Ont.

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WILLIAM A. HAVEN, for the past 10 years superintendent of blast furnaces at Youngstown for the Republic Iron & Steel Co., has resigned to become associated with Arthur G. McKee & Co., Cleveland, engineers and contractors, as vice-president.

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THOMAS J. BRAY, JR., has tendered his resignation, effective March 15, as assistant general superintendent of the Republic Iron & Steel Co., Youngstown. He will join the Chicago sales department of Koppers Construction Co., Pittsburgh.

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CAIO LUIS PEREIRA DE SOUSA, general manager, Metallurgical Co. of Brazil, Sao Paulo, Brazil, sailed for home Saturday, Feb. 23, after a sojourn of about two months in the United States. Dr. de Sousa is a son of Washington Luis, president of the Republic of Brazil. His company manufactures centrifugal cast iron pipe and turns out a product as small as 2¾ in. in diameter.

Production Conference in Progress at Pittsburgh

A production executives' conference is in progress at Webster Hall Hotel, Pittsburgh, scheduled for Feb. 27, 28 and March 1, by the Production Executives' Division of the American Management Association with the cooperation of the Management Division of the American Society of Mechanical Engineers.

The subjects include: Factory and Operating Organization; Specialists, Their Functions, Activities and Relationships with the Line Organization and with Each Other; Theories and Types of Organization, Research and Development Departments, Maintenance and Repair Departments, Inventory Control, Accounting, Planning and Production Control, Time Study, Motion Study and Rate-Setting Departments.

Building Hot-Strip Mill

The Illinois Steel Works has started construction of a new hot-strip mill, of 25,000 tons a month capacity, at its Gary works.

The waste elimination committee of the American Society of Mechanical Engineers, engaged in crystallizing interest in the topic for engineering meetings throughout the country in April, is composed of H. R. Westcott, Westcott & Mapes, Inc., New Haven; S. H. Libby, General Electric Co., Bloomfield, N. J.; C. B. Auel, Westinghouse Electric & Mfg. Co., East Pittsburgh; Charles W. Lytle, New York University, New York, and George E. Hagemann, Ronald Press Co., New York.

Railroad Equipment

Chesapeake & Ohio Buys 2500 Freight Cars

ORDERS for 3100 freight cars placed during the week included 2500 for the Chesapeake & Ohio and 400 for the Minneapolis, St. Paul & Sault Ste. Marie. The Southern Pacific is in the market for 250 tank cars. Details of the week's business follow:

Chesapeake & Ohio has ordered 1500 gondola cars from American Car & Foundry Co., 500 from Standard Steel Car Co. and 500 box cars from Pressed Steel Car Co.

Minneapolis, St. Paul & Sault Ste. Marie has ordered 200 box cars from Pullman Car & Mfg. Corporation and 200 from Standard Steel Car Co.

Southern Pacific has ordered 10 lounge and three observation cars from Pullman Car & Mfg. Corporation and will buy 65 gondola cars and 250 tank cars.

Canadian National has ordered three baggage-mail cars from American Car & Foundry Co. and two parlor-buffet cars from Pullman Car & Mfg. Corporation.

Lehigh & Hudson River has ordered one combination coach from Bethlehem Steel Co.

Atchison, Topeka & Santa Fe has ordered two dining cars from Pullman Car & Mfg. Corporation.

Illinois Central has ordered 25 caboose cars from American Car & Foundry Co.

Missouri-Kansas-Texas has ordered 50 70-ton ore cars from Standard Steel Car Co.

Wheeling & Lake Erie has ordered 100 flat cars from Standard Steel Car Co.

St. Louis-San Francisco has ordered 300 underframes from Pullman Car & Mfg. Corporation.

Baltimore & Ohio is inquiring for 10 mail compartment and 15 mail express cars.

Nevada Consolidated Copper Co. has ordered one consolidation type locomotive from American Locomotive Co.

Norfolk & Western has ordered repairs and rebuilding of 1000 57½-ton hopper cars from Virginia Bridge & Iron Co.

Andes Copper Mining Co. has ordered 10 40-ton flat cars from Koppel Industrial Car & Equipment Co.

Royal State Railways of Siam will receive bids until May 14 at offices of superintendent of stores, Bangkok, Siam, on six Garrett type locomotives and until April 16 on 51 bogie wagons. Specifications and plans may be obtained from Messrs. Sandberg, 25 Broadway, New York.

Southern Manchurian, Dairen, Manchuria, has ordered 30 air-dump cars from Magor Car Corporation.

Chicago & North Western will buy five passenger and baggage cars.

Northern Pacific has entered the market for five mail and express cars.

The Wrought Iron Co. of America, with plants at Lebanon and Scranton, Pa., has opened a branch office at 393 Seventh Avenue, New York. The company manufactures refined bar iron, staybolt iron, reinforcing bars, shapes, spikes, bolts, nuts, washers and puddled wrought iron rivets. C. E. Brodhead is sales manager at New York.

New Card of Extras for Cold-Rolled Strip Steel

ALTHOUGH not all makers of cold-rolled strip steel have adopted the new card of extras, a sufficient number have done so to assure its general usage within a short time. The new extras, as previously explained in THE IRON AGE market reports, make lower net prices on some of the extreme widths, but increase materially the net prices on the very narrow widths. It is stated in the trade that the new extras will probably apply on all second quarter contracts.

The extras shown in the tables below are to be added to the base price, the base sizes being 6 in. to 24 in., 0.161 in. and thicker, in coils, hard temper, No. 2 finish, 0.20 carbon and under. There are special extras for cut lengths, 24 in. and longer. Lengths under 24 in. will be quoted by mills upon application. The minimum charge shall be for not less than 100 lb. of a size. In addition to the size extras, quantity extras on small lots will be charged as follows: 2000 to 5999 lb. of one size, 25c. per 100 lb.; 1000 lb. to 1999 lb., 65c.; 500 lb. to 999 lb., $1.25; 300 to 499 lb., $2.25; 200 lb. to 299 lb., $3.25; 100 lb. to 199 lb., $5.25. For No. 3 finish, there is an extra of 25c. per 100 lb. The extra for boxing, crating or wrapping is also 25c. for each 100 lb. of material.

The charge for cutting to length, it is stated, does not relieve buyer from scrap loss, and short pieces left from cutting will be shipped and invoiced at price of long lengths. If lengths over 36 in. are ordered and no short pieces are taken 10 per cent will be added to the net price.

The new size extras follow:

COILS

Thickness	Under ½ to ⅞ In. Inc.		Under 1 to ½ In. Inc.		Under 1½ to 1 In. Inc.		Under 3 to 1½ In. Inc.		3 to 6 In. Inc.		Over 6 to 9 In. Inc.		Over 9 to 12 In. Inc.		Over 12 to 16 In. Inc.		Over 16 to Under 24 In.	
	Hard	Soft	Hard	Soft	Hard	Soft	Hard	Soft	Hard	Soft	Hard	Soft	Hard	Soft	Hard	Soft	Hard	Soft
0.161 and heavier	2.00	2.45	1.35	1.80	.85	1.30	.50	.95	.25	.70	B	.45	B	.45	B	.45	B	.45
0.160 to 0.100	1.85	2.30	1.20	1.65	.75	1.20	.50	.95	.25	.70	.10	.55	.10	.55	.10	.55	.10	.55
0.099 to 0.069	1.45	1.90	1.05	1.50	.70	1.15	.50	.95	.40	.85	.20	.65	.20	.65	.20	.65	.20	.65
0.068 to 0.050	1.55	2.00	1.15	1.60	.80	1.25	.55	1.00	.50	.95	.30	.75	.30	.75	.30	.75	.30	.75
0.049 to 0.040	1.70	2.25	1.30	1.85	.95	1.50	.70	1.25	.65	1.20	.45	1.00	.45	1.00	.45	1.00	.45	1.00
0.039 to 0.035	1.70	2.25	1.30	1.85	.95	1.50	.70	1.25	.65	1.20	.60	1.15	.60	1.15	.60	1.15	.60	1.15
0.034 to 0.032	2.10	2.80	1.60	2.30	1.35	2.05	.90	1.60	.85	1.55	.75	1.45	.75	1.45	.75	1.45	.75	1.45
0.031 to 0.029	2.30	3.00	1.80	2.50	1.55	2.25	1.10	1.80	1.05	1.75	.80	1.50	.90	1.60	.95	1.65	.95	1.65
0.028 to 0.026	2.40	3.10	1.90	2.60	1.65	2.35	1.20	1.90	1.15	1.85	.90	1.60	1.10	1.80	1.15	1.85		
0.025 to 0.023	2.60	3.30	2.10	2.80	1.85	2.55	1.40	2.10	1.35	2.05	1.25	1.95	1.50	2.20	1.60	2.30		
0.022 to 0.020	2.75	3.45	2.25	2.95	2.00	2.70	1.55	2.25	1.50	2.20	1.50	2.20	1.85	2.55				
0.019 to 0.017	3.60	3.60	3.20	3.20	2.95	2.95	2.50	2.50	2.35	2.35	2.60	2.60	2.85	2.85				
0.016 to 0.015	4.15	4.15	3.75	3.75	3.50	3.50	3.05	3.05	2.90	2.90	3.15	3.15						
0.014 to 0.013	4.80	4.80	4.40	4.40	4.15	4.15	3.80	3.80	3.80	3.80	4.20	4.20						
0.012	5.45	5.45	5.05	5.05	4.80	4.80	4.45	4.45										
0.011	5.70	5.70	5.30	5.30	5.05	5.05	4.70	4.70										
0.010	6.15	6.15	5.75	5.75	5.50	5.50	5.15	5.15										

LENGTH 24 IN. AND LONGER

Thickness	Under ½ to ⅞ In. Inc.		Under 1 to ½ In. Inc.		Under 1½ to 1 In. Inc.		Under 3 to 1½ In. Inc.		3 to 6 In. Inc.		Over 6 to 9 In. Inc.		Over 9 to 12 In. Inc.		Over 12 to 16 In. Inc.		Over 16 to Under 24 In.	
	Hard	Soft	Hard	Soft	Hard	Soft	Hard	Soft	Hard	Soft	Hard	Soft	Hard	Soft	Hard	Soft	Hard	Soft
0.161 and heavier	3.50	3.95	1.85	2.30	1.20	1.65	.85	1.30	.50	.95	.25	.70	.25	.70	.25	.70	.25	.70
0.160 to 0.100	3.35	3.80	1.70	2.15	1.10	1.55	.85	1.30	.50	.95	.35	.80	.35	.80	.35	.80	.35	.80
0.099 to 0.069	3.45	3.90	2.05	2.50	1.25	1.70	1.05	1.50	.85	1.30	.65	1.10	.65	1.10	.65	1.10	.65	1.10
0.068 to 0.050	3.55	4.00	2.15	2.60	1.35	1.80	1.10	1.55	.95	1.40	.75	1.20	.75	1.20	.75	1.20	.75	1.20
0.049 to 0.040	3.70	4.25	2.30	2.85	1.50	2.05	1.25	1.80	1.10	1.65	.90	1.45	.90	1.45	.90	1.45	.90	1.45
0.039 to 0.035	3.70	4.25	2.30	2.85	1.50	2.05	1.25	1.80	1.10	1.65	1.05	1.60	1.05	1.60	1.05	1.60	1.05	1.60
0.034 to 0.032	5.10	5.80	3.10	3.80	2.25	2.95	1.80	2.50	1.55	2.25	1.45	2.15	1.45	2.15	1.45	2.15	1.45	2.15
0.031 to 0.029	5.55	6.25	3.80	4.50	2.80	3.50	2.35	3.05	2.00	2.70	1.75	2.45	1.85	2.55	1.90	2.60	1.90	2.60
0.028 to 0.026	5.90	6.60	3.90	4.60	2.90	3.60	2.45	3.15	2.10	2.80	1.85	2.55	2.05	2.75	2.10	2.80		
0.025 to 0.023	6.60	7.30	4.60	5.30	3.45	4.15	3.00	3.70	2.55	3.25	2.45	3.15	2.70	3.40	2.80	3.50		
0.022 to 0.020	7.25	7.95	4.75	5.45	3.60	4.30	3.15	3.85	2.70	3.40	2.70	3.40	3.05	3.75				
0.019 to 0.017	9.60	9.60	7.20	7.20	6.25	6.25	5.80	5.80	4.90	4.90	5.15	5.15	5.40	5.40				
0.016 to 0.015	11.15	11.15	7.75	7.75	6.80	6.80	6.35	6.35	5.45	5.45	5.70	5.70						
0.014 to 0.013	12.80	12.80	9.65	9.65	8.65	8.65	8.30	8.30	7.30	7.30	7.70	7.70						

British Steel Trade Improving

Nail Makers Want Foreign Nail Kegs Marked—South African Railroad Buys Locomotives in United States, Britain and Germany

(*By Cable*)

LONDON, ENGLAND, Feb. 25.

THE pig iron situation continues to improve and the shortage of output is more apparent while costs tend upward with higher markets for ore and fuel. Cleveland furnace stocks of foundry and hematite iron are virtually exhausted. Some sales of hematite to Italy are reported and prices are tending upward.

Finished steel demand is affected by the severe weather which has been freezing erecting and other machinery, especially at shipyards, but conditions are improving. Continental steel demand here is quiet, semi-finished consumers buying foreign material only when absolutely necessary, so that supplies of domestic steel are scarce. Sellers are demanding the full prices and £5 6s. 6d. ($25.82) per ton f.o.b. has been paid for sheet bars.

The tin plate makers meet Tuesday, Feb. 26. It is believed that the minimum price will be increased because of higher costs. Meanwhile business is quiet, but most mills are well booked ahead.

Galvanized sheets are quieter and prices have eased off slightly, but mills are well sold to the end of March. Japan is inquiring for some good tonnages of light-gage black sheets but only small orders have resulted so far.

Continental reports state that serious difficulties have arisen in the European Rail Makers Association as a result of the German claim that reparations deliveries, hitherto reckoned on the basis of two-thirds of the tonnage for quota calculation, be ignored in the future. Also there is the British request for a higher quota. Strong opposition is being made to both the German and British demands.

Cammell, Laird & Co., Sheffield, have booked 520 trucks for the Central Argentine Railway, Beyer, Peacock & Co., Manchester, two metergage locomotives for the Leopoldina Railway, Sir W. G. Armstrong, Whitworth & Co., Newcastle-on-Tyne, 46 boilers and a large contract for parts in locomotive superheaters for the Indian railroads, and the Hinslet Engine Co., two locomotives for the Ceylon Government. The South African Railways has distributed a locomotive order to the Baldwin Locomotive Works, Philadelphia, the North British Locomotive Co., Glasgow, and Henschel & Co., of Germany, so as to assure delivery by midsummer.

The British Steel Nail Association is requesting a Government order that imported cut steel and iron nails shall bear an indication of the country of origin, placed upon each keg or bag of nails.

The Prime Minister, rejecting the request of the Iron and Steel Trades Confederation for an inquiry into conditions in the British iron and steel industry states that if his party is returned to power, following the general election, the iron and steel industry will be permitted to make application, under the Safeguarding of Industries Act. The Confederation is dissatisfied with this reply.

Lord Invernairn, formerly Sir William Beardmore, says: "Baldwin shirked his duty. The steel industry is in a pitiable state and wholesale amalgamation offers the only solution, while for complete reestablishment of industry, trustification is necessary and the situation is so serious that no time should be lost."

Japan's Machinery Purchases Downward

Machinery Imports from Germany Gained in 1927, While British and American Trade Declined

WASHINGTON, Feb. 26.—General business slackness was probably the chief cause for the further decline of activity in the machinery market in Japan during 1927, according to a report just prepared by L. J. Cochrane, industrial machinery division, Department of Commerce. This downward trend, it is pointed out, has been noticeable since 1921, with

British and Continental European prices per gross ton, except where otherwise stated, f.o.b. makers' works with American equivalent figured at $4.85 per £ as follows:

Durham coke, del'd	£0	18s.				$4.37		
Bilbao Rubio ore*	1	2	to £1	2½s.		5.34	to	$5.46
Cleveland No. 1 foundry	3	9½				16.85		
Cleveland No. 3 foundry	3	7				16.25		
Cleveland No. 4 foundry	3	6				16.00		
Cleveland No. 4 forge	3	5½				15.88		
Cleveland basic (nom.)	3	5				15.76		
East Coast mixed	3	12½				17.58		
East Coast hematite	3	13				17.70		
Rails, 60 lb. and up	7	15	to	8	5	37.59	to	40.01
Billets	6	5	to	6	15	30.31	to	32.73
Ferromanganese	13	15				66.69		
Ferromanganese (export)	13	10	to	14	0	65.47	to	67.90
Sheet and tin plate bars, Welsh	5	2½				25.82		
Tin plate, base box	0	18	to	0	18¼	4.37	to	4.43
Black sheets, Japanese specifications	13	7½				64.87		
						C. per Lb.		
Ship plates	7	12½	to	8	2½	1.66	to	1.76
Boiler plates	9	0	to	10	10	1.95	to	2.27
Tees	8	2½	to	8	12½	1.76	to	1.86
Channels	7	7½	to	7	17½	1.60	to	1.71
Beams	7	2½	to	7	12½	1.55	to	1.65
Round bars, ¾ to 3 in.	7	15	to	8	5	1.67	to	1.78
Steel hoops	9	0	to	10	0	1.95	to	2.16
Black sheets, 24 gage	10	0				2.16		
Galv. sheets, 24 gage	13	10	to	13	12½	2.92	to	2.95
Cold rolled steel strip, 20 gage (nom.)	12	0				2.64		

*Ex-ship, Tees, nominal.
(a) Nominal.

Continental Prices All F.O.B. Channel Ports

(Per Metric Ton)

Foundry pig iron (a):								
Belgium	£3	6s.	to	£3	10s.	$16.00	to	$16.97
France	3	6	to	3	10	16.00	to	16.97
Luxemburg	3	6	to	3	10	16.00	to	16.97
Basic pig iron (a):								
Belgium	3	6				16.00		
France	3	6				16.00		
Luxemburg	3	6				16.00		
Coke	0	18				4.37		
Billets:								
Belgium	5	5				25.46		
France	5	5				25.46		
Merchant bars:						C. per Lb.		
Belgium	6	2½	to	6	3	1.33	to	1.34
France	6	2½	to	6	3	1.33	to	1.34
Luxemburg	6	2½	to	6	3	1.33	to	1.34
Joists (beams):								
Belgium	5	2½	to	5	3	1.12	to	1.13
France	5	2½	to	5	3	1.12	to	1.13
Luxemburg	5	2½	to	5	3	1.12	to	1.13
Angles:								
Belgium	6	0	to	6	2	1.31	to	1.32
¼-in. plate:								
Belgium (a)	6	11½	to	6	12	1.44	to	1.45
Germany (a)	6	11½	to	6	12	1.44	to	1.45
⅜-in. ship plate:								
Belgium	6	6	to	6	7	1.38	to	1.39
Luxemburg	6	6	to	6	7	1.38	to	1.39
Sheets, heavy:								
Belgium	6	1				1.31		
Germany	6	1				1.31		

the exception of 1924 after the earthquake, and is held to have been occasioned in part by the continued industrial development and increasing domestic production of the smaller and simpler kinds of machinery in Japan.

As compared with 1926, imports of industrial machinery by Japan during 1927 declined by 5,645,000 yen ($2,676,000), or 11 per cent, to 46,547,000 yen ($22,068,000). The yen during 1927 was valued at $0.4741 and during 1926 at $0.4712. This loss was largely taken by Great Britain and the United States whose trade with Japan in the industrial machinery line declined by 35 per cent and 14 per cent respectively. German business, on the other hand, showed a sharp increase, rising by 4,689,000 yen, or 63 per cent, to 12,135,000 yen ($5,752,000), which was accounted for partly by lower prices, more suitable to the reduced purchasing power of the Japanese. This raised Germany to second place, supplanting Great Britain, with the United States maintaining the lead.

What Each Furnished

The value of imports from the United States in 1927 was 18,662,000 yen, ($8,848,000), while those from Germany were valued at 12,135,000 yen ($5,752,000) and those from the United Kingdom, 10,460,000 yen ($4,959,000). Germany's gains were mostly in steam boilers, fuel economizers, steam turbines, pumps, looms, knitting machinery and pneumatic tools, while its deliveries of metal and woodworking machinery and of spinning machinery registered particularly sharp increases over 1926.

Great Britain showed declines all along the line, particularly in steam boilers, fuel economizers, steam turbines and engines, cranes, blowers, hydraulic presses, pneumatic tools, tissue finishing machines and paper machinery. Principal losses in American equipment were in steam and water turbines, cranes, air compressors, pneumatic tools, tissue finishing machinery and paper machinery. Increased exports were shown in steam boilers, fuel economizers, steam engines, gas and petroleum engines, pumps, hydraulic presses, metal and woodworking machinery and knitting machinery.

French Agriculture Large User of Copper

BORDEAUX, FRANCE, Feb. 5.—Large wine-producing countries, such as France, Italy, Spain and Portugal, are consumers of copper in the form of copper sulphate to an extent not generally realized. In France, alone, the amount of copper sulphate, of which solutions are sprayed on grape vines, fruit trees and vegetables, reaches a total of 85,000 to 100,000 tons a year, requiring 20,000 to 25,000 tons of copper annually.

This extensive use of copper agriculturally is considered indispensable, for without it maintenance of wine production would be almost impossible, as the grape vines quickly succumb to attacks of mildew and other fungi unless frequently sprayed with a solution of sulphate of copper.

Rumania Plans Great Railroad Rehabilitation

BUCHAREST, RUMANIA, Feb. 4.—A plan for the improvement of the Rumanian railroads, which has been approved by a French railroad engineer, reduces the total expenditure for the project from 41,000,000,000 lei ($246,000,000), the estimate of Rumanian engineers, to a total of 21,600,000,000 lei ($129,600,000). Of the total to be expended under the French engineer's plan, 12,000,000,000 lei ($72,000,000) will be required for replacement of rails on 1400 km. of line, for installation of new signal and safety devices, for strengthening of bridges, for double tracking 344 km. of single track lines, for enlargement of stations, extension of telegraph and telephone lines and the repair and purchase of additional rolling stock.

The remaining 9,600,000,000 lei ($57,600,000) will be used to complete lines already under construction. The first work of this kind will be in completing the Braschov-Buzeo line, which connects the industrial districts in Transylvania with the Danube, Galatz and Braila. Included in the plan for rehabilitation of the railroads is a stabilization loan, which prescribes that France is to receive orders for railroad material in proportion to French participation in the loan. The French engineer, M. Leverve, is to be adviser to the Rumanian railroad commission for at least three years.

Proposal for German Tariff Reduction Expected

HAMBURG, GERMANY, Feb. 6.—Certain downward revisions in the steel schedule of the German tariff will probably be proposed this spring. Effective Feb. 1, the schedule for nonferrous metals was revised downward and certain products were placed on the free list. The proposal for changes in the iron and steel schedule is expected to be made by the Government and will probably suggest reductions in the duties on pig iron, structural shapes, wire products and other finished materials. This move, although it will be supported by machinery manufacturers, is expected to fail in view of the higher tariffs of competitive countries, such as France, Czechoslovakia and Belgium.

Sweden Foresees Better Iron and Steel Business

STOCKHOLM, SWEDEN, Feb. 5.—At the annual meeting of the "Friends of Metallurgy" the outlook for mining and steel production was described as better than at any time in the past 10 years. It was stated that foreign markets are taking more Swedish steel and that domestic engineering plants are quite active, especially for export business.

The Swedish Ironworks Association reports iron and steel production in 1928 to have been 393,000 tons of pig iron, compared with 417,000 tons in 1927. Pig iron exports totaled 72,000 tons, compared with 87,000 tons in 1927. Output of rolled and forged products was 413,000 tons, compared with 338,000 tons in 1927, and exports were 153,000 tons, compared with 132,000 tons in 1927. Output of pig iron and steel is still below pre-war levels. In 1913 pig iron production was 730,000 tons, and output of rolled and forged products, 465,000 tons.

German Foreign Trade in Iron and Steel* during November and December, 1928 (in metric tons)

	Exports		Imports	
	November	December	November	December
Pig iron and ferroalloys	32,614	23,993	18,492	21,718
Ingots, blooms and billets	21,583	8,885	17,057	26,925
Iron and steel bars, rods and angles	72,790	42,026	49,134	59,131
Structural steel	9,238	3,356	511	333
Hoops and bands	12,410	7,210	5,980	12,127
Plates and sheets	41,828	20,330	6,043	11,386
Galvanized sheets	2,451	1,563	282	370
Tin plate	2,341	3,773	2,029	2,456
Cast iron pipe	7,669	6,043	2,886	6,470
Wrought iron pipe	24,422	12,138	3,268	5,108
Pipe fittings	3,663	4,171	83	193
Rails	27,076	15,675	6,596	6,635
Other railroad material	4,555	5,654	688	1,265
Plain wire	33,584	24,455	9,710	12,865
Barbed wire	5,744	4,449	48	281
Wire rope	1,116	978	43	108
Wire cloth	2,052	2,278	13	3
Other wire manufactures	652	793	55	40
Nails, tacks, rivets and washers	11,256	9,034	211	341
Castings and forgings	16,801	15,576	1,932	1,889
All other	4,516	3,729	816	849
Total	338,361	216,109	125,877	170,493

*Reported to the Department of Commerce, Washington, by Trade Commissioner James E. Wallis, Jr., Berlin.

Czechoslovakian Production Increased in 1928

PRAGUE, CZECHOSLOVAKIA, Feb. 5.—Production of iron and steel in 1928 is provisionally reported at 1,400,000 metric tons of pig iron, compared with 1,260,000 tons in 1927, and 2,100,000 tons of steel, compared with 1,680,000 tons in 1927. Most of the increase in iron and steel production was contributed by the Witkowitzer Bergbau und Eisenhütten Gewerkschaft at Witkowitz, Moravia, and the Prager Eisenindustrie Gesellschaft in Prague. Greater output last year is attributed to an increase in domestic demand, although Czechoslovakian producers exceeded the export quota of 432,800 metric tons established by the International Steel Cartel. Coal and lignite production registered a slight increase over 1927.

The Skoda Steel Works A. G. at Pilsen has received a proposal from Spain to establish a steel mill at Madrid for the production of special grades of steel to supply the Spanish and South American markets.

Foundry Equipment Orders Up

The index of gross orders of members of the Foundry Equipment Manufacturers Association rose from 166.5 in December to 180.5 in January. In January, 1928, the index stood at 132.7. The index of shipments in the first month of this year was 177.3, compared with 234.6 in the previous month. Unfilled orders, as of Feb. 1, stood at 336.1, compared with 333.8 one month previously.

British Foreign Trade in Iron and Steel Gains

WASHINGTON, Feb. 23.—Improved conditions in the British iron and steel industry were reflected in a radiogram received by the Iron and Steel Division, Department of Commerce, from Commercial Attaché William L. Cooper, London, showing that exports in January increased to 421,191 gross tons, against 358,743 tons in December, while imports rose to 244,267 tons from 183,668 tons; steel ingot production increased to 761,600 tons from 683,100 tons, and pig iron output increased to 563,900 tons from 540,400 tons. The number of active open-hearth furnaces was 304 at the end of January, compared with 260 at the end of December, while the number of active blast furnaces increased to 139 from 132.

The gain of 62,448 tons in exports in January was reflected principally in galvanized sheets, which increased 28,951 tons to 82,524 tons; in tin plate, which rose 13,853 tons to 48,158 tons; in rails, which increased 12,219 tons to 34,620 tons; and in plates and sheets, which advanced 4683 tons to 49,880 tons.

The increase of 60,599 tons in imports in January applied to all but three classes. The largest single gain was that registered in ingots and semi-finished steel, which rose 19,824 tons to 91,169 tons. Steel bar imports increased 14,114 tons to 42,805 tons.

Another High Record in By-Product Coke

WASHINGTON, Feb. 23.—Aggregating 4,360,194 tons, production of by-product coke in January, for the fourth consecutive month, set a new record of daily average output, according to the Bureau of Mines. In comparison with December, the previous maximum, this was an increase of 43,000 tons; compared with January of last year, an increase of 463,000 tons. The output of beehive coke also increased, rising to 479,100 tons in January from 397,800 tons in December.

The Rockford Gas Light & Coke Co., Rockford, Ill., put into operation during January a new by-product plant of 21 Koppers-Becker ovens, and the Central Alloy Steel Corporation added 15 new Koppers-Becker ovens to its plant at Canton, Ohio. There are now 85 active by-product coke plants in the United States, all of which produced coke in January. Five old plants have been idle for some time, though not permanently dismantled.

Greater Production of Steel Barrels

Steel barrels produced in January by 27 companies in 31 plants numbered 558,492, according to the Department of Commerce. This represents 48.4 per cent of capacity. It shows an increase of 7379 barrels over the December total of 551,113 units, and a greater increase over the 475,906 units made in January, 1928. Except for December, January and February, however, the total is smaller than for any month of 1928.

Shipments as usual were close to production. They numbered 548,581 units, which is slightly less than in the preceding month. Stocks increased by about 10,000 units to 56,376, which is the highest since the end of August. Unfilled orders increased sharply to 319,704 for delivery within 30 days and to 1,342,006 for delivery beyond 30 days. This makes the largest total in 23 months.

Automobile Output Largest for Any January

WASHINGTON, Feb. 23.—Production of motor vehicles in the United States in January totaled 402,154 units, reflecting the sharp increase of 71.9 per cent over the December output of 233,907 units, according to the Department of Commerce. Of the January production, 350,617 units were passenger cars, an increase of 70.3 per cent over the 205,793 passenger cars produced in December; the production of trucks in January totaled 51,537 units, a gain of 83 per cent over the output of 28,114 in January.

January production, by far the largest for any corresponding month, compares with 231,728 units in January, 1928. The highest previous January was in 1924, with 318,589 units. No other January except in 1926, with 308,998, reached 250,000.

Canadian production in January was 21,501 units, of which 17,164 were passenger cars and 4337 were trucks. This compares with a production of 9425 in December, of which 6734 were passenger cars and 2691 were trucks, and was the largest total for any January.

Austria Had Large Year in Iron and Steel

WASHINGTON, Feb. 26. — During 1928 the Alpine Steel Works, producing more than 75 per cent of the entire output of Austria, attained practically capacity operation for the first time since the war, according to a report received from Commercial Attaché H. Lawrence Groves, Vienna. Pig iron production rose to 458,186 metric tons as against 431,118 tons in 1927. Ingot production totaled 451,696 tons as compared with 365,875 tons, while rolled steel production was 356,671 tons last year and 295,079 tons in 1927. The increased activity of 1928 was attributed in large part to the larger orders placed by the Austrian Federal railroads.

Steel Boiler Orders Drop

Orders for steel boilers in January, totaling 1075 units with 1,243,479 sq. ft. of heating surface, were less than for several months immediately preceding. The December total was 1343 units and 1,308,125 sq. ft. In January, 1928, orders included 1244 units and 992,785 sq. ft. The average month of 1928 accounted for 1639 units and 1,473,734 sq. ft.

High Babbitt Consumption

WASHINGTON, Feb. 26.—Total apparent consumption of Babbitt metal in January was 6,093,267 lb., as compared with 4,985,942 lb. in December and 4,928,517 lb. in January, 1928, according to reports received by the Department of Commerce. The January total was the greatest since March, 1926, in face of a declining trend over the past four years.

The Truscon Steel Co., Youngstown, has announced an expansion program which calls for the building of fabricating plants at Chicago, Birmingham, Boston and Baltimore during the next four years. Approximately $1,000,000 a year will be spent on the new properties.

Large Gains in Sheet Steel Orders and Shipments

The speeding up of the automotive industry is reflected in a large increase in sales, production, shipments and unfilled orders for steel sheets during January, as shown by the monthly report of the National Association of Flat Rolled Steel Manufacturers, Cleveland, covering the independent mills. Unfilled orders Feb. 1 amounted to 652,602 tons, a gain of 60,000 tons over those of Jan. 1 at 592,094 tons. Sales in January were 438,390 tons, a gain of 115,000 tons compared with December, and production amounting to 391,404 tons showed an increase of nearly 90,000 tons over the previous month. Shipments of 362,229 tons were more than 65,000 tons over those of the previous month. Sales were 46,986 tons in excess of production and 76,161 tons greater than shipments. The January report and comparison in net tons follow:

	Jan.	Dec.	Nov.
Total number of mills	725	726	726
Capacity per month	507,500	452,500	487,280
Percentage reporting	70.2	70.2	70.2
Sales	438,390	323,421	346,041
Production	391,404	302,182	358,402
Shipments	362,229	296,687	307,790
Unfilled orders	652,602	592,094	565,739
Unshipped orders	135,135	124,679	111,014
Unsold stocks	63,739	66,750	63,014
Percentages of Capacity			
Sales	123.1	101.8	101.1
Production	109.9	95.1	104.8
Shipments	101.7	93.4	89.9
Unfilled orders	183.2	186.3	165.3
Unshipped orders	37.9	39.2	32.4
Unsold stocks	17.9	21.0	18.4

Research Going Forward on Mechanical Springs

With the widespread support of industry during the first year of actual research, the American Society of Mechanical Engineers' special research committee on mechanical springs has attained several definite objectives.

During 1928 the laboratory facilities of Union College, Schenectady, were used for a start on the committee's program under the direction of Prof. M. F. Sayre, and the committee's research associate, Anthony Hoadley. Prompted by suggestions received from many manufacturers, the committee has decided to undertake a study of the fatigue and the fatigue-corrosion properties of spring materials, and in this connection has obtained the facilities of the United States Naval Experimental Station at Annapolis, Md., and the services of Dr. D. J. McAdam, Jr., who is at present supervising the experimental work. Experiments are being conducted for the committee at Lehigh University, Bethlehem, Pa., by M. S. Gjesdahl for the purpose of confirming the theoretical deductions of Prof. J. B. Reynolds, also at the University.

Simplification of Files and Rasps

Increase in volume of business, accompanied by decrease in inventory, is reported by concerns which have adopted "simplified practice recommendations" in the manufacture of steel files and rasps. This development was started by the Conservation Division of the War Industries Board in 1918. It was found at that time that 1351 varieties were being made, whereas less than one-half that number would meet normal demands. Consequently, the Conservation Division effected an elimination of 732 items.

Further reduction in the number of varieties, under the auspices of the Division of Simplified Practice, leaves 484 of the original 1351, or only a little more than one-third. A survey of production conducted by the division two years ago showed that 93 per cent of the total volume produced by those who had accepted the recommendation was in the standard sizes and types comprising the simplified list. Several manufacturers declared that consumer demand indicated that further elimination could advantageously be made.

Decrease in volume of inventory by 25 per cent, accompanied by increase in volume of sales amounting to more than 33 per cent, was reported by one manufacturer. Another showed sales increase of 23½ per cent, with inventory decrease of 35 per cent. Other benefits cited were reduced investment in dies and in inventory, quicker turnover and better control of production. Similar benefits have accrued to distributers, with the addition of less storage requirements and better service from the manufacturer.

New Plans for Washington Museum

New plans are in the making for the museum at Washington devoted to engineering and industry. Application has been made for a site of upward 100 acres at the extreme east end of Capitol Street, the major axis of Washington. This would put the museum as far toward the east as is the Lincoln Memorial in the west, with the Washington Monument and the Capitol in between. It is proposed to develop the area somewhat along the lines of the British Exhibition at Wembley in 1925, or the Fair of the Iron Horse by the Baltimore & Ohio Railroad at Halethorpe, Md., in 1927.

The plans also comprehend getting Congress to correlate the various museums and activities of the kind according to some national plan, having in mind some intertying of the industrial museums instituted by the late Henry R. Towne in New York, Julius Rosenwald in Chicago and Henry Ford in Dearborn, Mich.

The National Museum of Engineering and Industry, headed by Thomas Ewing as president and with headquarters at 17 East Forty-second Street, New York, is seeking membership of all who are responsive to the broad proposal that there shall be adequate educational exhibit institutions devoted to the progress of this country through invention and engineering. It is striving to find ways and means to raise the large funds of money needed to put through the project, so that there may be a development in this country at least commensurate with what exists in industrial museums in Germany and in England.

Coated Abrasive Products Simplified

Instead of 8000 varieties of coated abrasive products, spot stocks will now be limited to 1976, corresponding to an elimination of 75.3 per cent, according to the Department of Commerce Division of Simplified Practice. A descriptive pamphlet, available at 10c. from the Superintendent of Documents, Government Printing Office, Washington, shows that more than 600 concerns, in 44 States, have accepted the program.

Coated abrasive products include flint paper, garnet, sandpaper, etc. For years the quantity of sizes and varieties has been increasing at a rapid rate. Many thousands of varieties have been stocked and cataloged by the industry, when only a portion enjoyed a satisfactory turnover. This becomes a matter of considerable importance in view of the fact that the estimated annual output of the industry amounts to about $16,000,000.

Manufacture of Structural and Ornamental Steel Work

(*Returns from* 1927 *Census*)

	1927	1925	Per Cent Increase
Number of establishments	1,283	1,136	12.9
Wage earners (average for the year)*	52,392	48,341	8.4
Wages	$84,578,048	$77,411,499	9.3
Average wage	$1,615	$1,601	0.9
Cost of materials, mill supplies, fuel and purchased power, total	$243,446,072	$237,652,611	2.4
Materials and supplies	$238,980,005	(a)	....
Fuel and power	$4,466,067	(a)	....
Value of products	$440,376,360	$420,997,579 (b)	4.6
Value added by manufacture†	$196,930,288	$183,344,968	7.4
Horsepower	251,670	211,732	18.9

*Not including salaried employees.
(a) Not reported separately.
†Value of products less cost of materials, mill supplies, fuel and purchased power.
(b) In addition, $22,903,312 made in rolling mill plants and $18,954,868 made in other industries.

Machinery Markets and News of the Works

Machine Tool Orders Gain

February Business Will Exceed That of January in Many Instances—Outlook Continues Promising

ALL machine tool companies report a substantial increase in business in February, indicating that the average for the industry is well above the January total. If this proves to be true when the monthly figures of the National Machine Tool Builders' Association are compiled, it will be the tenth consecutive month in which sales have exceeded those of the previous month.

Some machine tool builders state that February was the best month since 1919; with others it was the best month since the war. As in preceding months, business has come from well diversified sources both as to industries and sections of the country, but the automobile and aircraft industries have been the largest buyers.

The Eclipse Machine Co., which makes starters for airplane engines at its East Orange, N. J., plant, has purchased a large list of tools. A promising development in the aircraft field is the letting of a contract for a $650,000 plant addition by the Packard Motor Car Co. for the manufacture of Diesel airplane engines. The new plant is scheduled for production of 500 engines a month by the middle of this year.

The New Departure Mfg. Co., division of the General Motors Corporation, will expend several million dollars for additions and equipment for its plants at Bristol, Meriden and Elmwood, Conn. An addition at Bristol is now under construction. The Chandler-Cleveland automobile plant in Cleveland, now owned by the Hupp Motor Car Corporation, Detroit, has an inquiry out for multiple spindle drilling machines. The Nash Motors Co. is expected to buy considerable equipment for its Kenosha plant.

New York

NEW YORK, Feb. 26.—To provide additional manufacturing facilities for increased output of starters for airplane engines, the Eclipse Machine Co. has bought a large list of tools for its plant at East Orange, N. J., which is entirely devoted to the airplane industry, the Elmira, N. Y., plant catering to the automobile industry. A varied line of tools was ordered, including engine lathes, turret lathes, milling machines, drilling machines, internal grinders, wet grinders, etc.

Sales and inquiries the past week have reached local sales offices in a steady and large volume. Some offices report that their sales for the first two months of 1929 will break all records. Purchases by the General Electric Co. against its list of about 75 tools, mentioned last week, are expected early in March. It is estimated that the company's expenditures for this list will be between $200,000 and $250,000.

H. L. Brandt, 38 Marble Hill Avenue, New York, architect, has plans for two-story automobile service, repair and garage building, to cost about $100,000 with equipment.

Eureka Smelting Co., 730 Fifth Avenue, New York, is arranging an expansion program at copper properties in Eureka and Hamilton, Nev. districts, including construction of new smelting plant at Blackburn, Nev., and extensions in railroad and conveying systems, to cost about $4,000,000 with machinery.

American Aeronautical Corporation, 740 Fifth Avenue, New York, recently organized to secure American rights to manufacture Savoia Marchetti aircraft, controlled by a company in Italy, has purchased 16 acres on Manhasset Bay, Port Washington, L. I., as site for plant for parts manufacture and assembling of seaplanes and amphibians. Project will also include airport and flying school, with hangars, repair shops and other buildings, and will represent an investment of more than $800,000 with equipment. Company has leased property at Whitestone, L. I., and will establish temporary plant there, with installation of machinery within 30 days, to be operated until Port Washington plant is completed in August. Enea Bossi is president; and Paul Zimmerman, engineer and designer, in charge of production.

Westchester Service Corporation, Hafaco Avenue, Port Chester, N. Y., has plans for two-story artificial ice-manufacturing plant to cost about $40,000 with equipment. Brutus Gundlach, 597 Fifth Avenue, New York, is architect.

General Outdoor Advertising Co., 1 Park Avenue, New York, has taken bids on general contract for branch plant at Denver, to manufacture signs, displays, etc., to be one story, 80 x 150 ft., with wing extension, 50 x 80 ft., to cost more than $50,000 with equipment. John E. Kleist is company architect.

Board of Contract and Supply, City Hall, Utica, N. Y., has plans for municipal automobile service, repair and garage building, to cost about $100,000 with equipment. R. J. Cookinham, city engineer, is in charge.

Essex County Board of Vocational Education, 969 Broad Street, Newark, is arranging appropriation of $700,000 for boys' vocational school at Bloomfield, N. J., for which plans are being prepared by Guilbert & Betelle, 20 Branford Place, architects.

Atlas Fence Co., 35-49 Verona Avenue, Newark, manufacturer of iron and wire fencing, has awarded general contract to Robert Allen, Inc., 319 Mount Prospect Avenue, for one-story addition to cost about $35,000 with equipment. A. H. McCully, 60 Schley Street, is architect.

Kohler Co., Kohler, Wis., manufacturer of sanitary ware, has taken over foundry portion of former caster and hardware specialty plant of Bassick Co., Passaic Avenue, Newark, comprising one-story building with more than 20,000 sq. ft. floor space, and will remodel for Eastern factory branch and distributing plant.

Automotive Equipment Co., 317 Halsey Street, Newark, has leased for expansion a three-story building at 123-27 Hudson Street, on site 90 x 100 ft., now in course of erection.

National Aero Corporation, Herbert and Market Streets, Perth Amboy, N. J., manufacturer of air-cooled aircraft motors, has work under way on one-story addition. Headquarters are at 100 East Forty-second Street, New York.

Oscar Goldschlag, 1482 Broadway, New York, engineer, has plans for two-story automobile service, repair and garage building at Jersey City, N. J., to cost about $170,000 with equipment.

Pneumelectric Corporation, 40 Flatbush Avenue Extension, Brooklyn, manufacturer of gages and precision instruments, has leased space in building at 305-11 East Forty-sixth Street, New York, for expansion.

New England

BOSTON, Feb. 25.—Dealers' February machine tool sales will be larger than for any previous month in about a year. New England machine tool builders also have had a good month. New tools sold the past week included large and medium sized lathes, drills, planers, shapers and miscellaneous equipment. Planers were the most active and included four to a Connecticut manufacturer, and single machines to other New England shops.

The used tool market continues quiet, the largest individual sale reported being a radial drill and two tool-room lathes to a Greater Boston shop. In an effort to augment floor stocks, used tool dealers are paying high prices for machinery. Sales of small tools are in good volume.

W. H. Robinson Metal Works, 278 Grove Street, Worcester, Mass., will soon start work on a one-story addition, 72 x 74 ft.

Arcand Spring Co., 229 Brighton Avenue, Allston district, Boston, manufacturer of automobile and truck springs, has plans for a one-story addition.

S. & S. Machine Die Casting Co., Providence, has purchased plant formerly owned by William H. Hamblyn Co., Cranston, R. I., and will equip for manufacturing.

Triad Mfg. Co., Pawtucket, R. I., radio tubes and supplies, is making renovations preparatory to installing machinery in a plant at Fountain Street and Blackstone Avenue.

Hartford Empire Co., Homestead Avenue, Hartford, Conn., manufacturer of glass plant machinery, has taken bids on general contract for a second story addition to factory unit, 98 x 105 ft., to cost about $50,000 with equipment. Buck & Sheldon, Inc., 60 Prospect Street, is architect and engineer.

Winchester Repeating Arms Co., New Haven, Conn., has arranged for bond issue of $6,500,000, part of proceeds to be used for expansion in manufacture of shot guns and sporting rifles. It will also increase facilities for production of cutlery and other products.

North Shore Cutting Die Co., Broad Street, Lynn, Mass., has filed plans for one-story plant unit, to cost about $20,000 with equipment.

Following recent organization of Stutz-Bellanca Airplane Corporation, Bridgeport, Conn., by Frank Bellanca, vice-president Commercial Aircraft Co., with local plant, plans are being completed for construction of assembling plant at Orlando, Fla., to cost more than $75,000 with equipment. Company will also take over plant of Commercial company primarily for manufacture of a new air-cooled airplane motor. Mr. Bellanca will be vice-president of new organization.

Blanchard Machine Co., State Street, Cambridge, Mass., manufacturer of grinding machines and parts, has awarded contract to Aberthaw Co., Boston, for addition to cost about $75,000.

Pneumatic Drop Hammer Co., Boston, maker of pneumatic lift gravity drop hammers, has removed offices from 261 Franklin Street to 141 Milk Street.

F. P. Lyons Iron Works, Inc., Manchester, N. H., has changed name to Lyons Iron Works, Inc. No changes have been made in operating personnel, H. G. Worrell continuing as president and general manager.

Philadelphia

PHILADELPHIA, Feb. 25.—General Electric Co., Witherspoon Building, Philadelphia, and Schenectady, has awarded general contract to United Engineers & Constructors, Inc., 112 North Broad Street, for addition to plant at Seventh and Willow Streets, primarily for storage and distribution, to cost about $130,000 with equipment.

E. J. McAleer & Co., Inc., Philadelphia, has been formed with capital of $285,000 to take over and expand company of same name, with plant at 1422 North Eighth Street, manufacturer of tinware products. Eugene McAleer is treasurer.

Board of Delaware County Commissioners, Media, Pa., is having plans drawn for a central power plant for steam heating, to cost more than $75,000 with equipment. George S. Idell, 1510 Chestnut Street, Philadelphia, is architect; Stewart A. Jellett Co., 1200 Locust Street, is engineer.

John A. Roebling's Sons Co., Trenton, N. J., manufacturer of wire rope, cables, etc., has awarded general contract to John W. Ferguson Co., Paterson, N. J., for addition, primarily for storage and distribution, to cost $125,000 with equipment.

Board of Education, Bridgeton, N. J., is planning installation of manual training equipment in new two-story high school to cost about $300,000, for which plans will be drawn by Edwards & Green, 548 Federal Street, Camden, N. J., architects; Walter Custer, Stanley Building, Bridgeton, is associate architect.

Kennedy Mfg. Co., Lutzville, Pa., has taken over a local factory and will manufacture metalware specialties. Building will be improved and machinery installed at once.

Harrisburg Gas Co., Harrisburg, Pa., has authorized plans for new equipment storage and distributing plant, with repair department, to cost about $250,000 with equipment, including service, repair and garage unit for company trucks and cars. A similar building, with repair facilities, pipe shop, etc., will be erected at Steelton, to cost more than $75,000. Company is arranging fund of $509,900 for extensions and improvements during 1929.

Savidge Corporation, care of William M. Hollinger, Caplan Building, Harrisburg, Pa., recently formed by W. G. Savidge, Sunbury, Pa., Mr. Hollinger and associates, to manufacture a patented nut-lock and brace for railroad switches, is considering erection of plant at Harrisburg, to cost about $45,000 with equipment. Isaac Rockefeller, Sunbury, is president; and Mr. Hollinger, vice-president.

Delaware Power & Light Co., Wilmington, Del., is planning an expansion program to cost $2,235,000, including construction of automatic power substation in western part of city, similar stations in other districts, transmission lines, switching stations, etc. Company is a subsidiary of United Gas Improvement Co., Philadelphia.

Superior Equipment Co., 204-6 Jefferson Street, Wilmington, Del., manufacturer of hydraulic shock absorbers and other hydraulic equipment, has taken over factory at Third Street and Greenhill Avenue, and will remove to new location and increase capacity.

Moisselle Welded Rail Joint Co., 716 Public Ledger Building, Philadelphia, has been organized to manufacture specially designed rail joint. Company has no plant and product will be manufactured by contract.

The Crane Market

INQUIRY for overhead traveling cranes is increasing, a usual development at this season. In addition to a number of inquiries for single cranes, there are three lists, one for 14 cranes to be bought by the Baldwin Locomotive Works for the new steel foundries at Eddystone, Pa., one for six cranes for the Chase Brass & Copper Co., Waterbury, Conn., and a third for five overhead cranes for an unnamed buyer. Other pending business includes a 15-ton overhead crane for the Standard Oil Co. of Louisiana and a special ash handling crane for the Hell Gate power station of the New York Edison Co. Locomotive crane inquiry is increasing, but only a small number of orders is reported.

Among recent purchases are:

Hercules Cement Co., Hercules, Pa., locomotive crane, 20-ft. gage, to handle 3-cu. yd. bucket at 90-ft. radius, from Orton Crane & Shovel Corporation.

Dominion Bridge Co., Ltd., Calgary, Alberta, used 25-ton American Hoist & Derrick Co., locomotive crane from A. R. Gelinas, Montreal.

Connecticut River Development Corporation, two 115-ton cranes for its St. Johnsbury, Vt., plant.

South Atlantic

BALTIMORE, Feb. 25.—United Railways & Electric Co., Continental Building, Baltimore, will take bids on general contract in about 30 days for one and two-story automobile service, repair and garage building for motor bus maintenance department, to cost $275,000 with equipment. W. H. Emory, 18 East Charles Street, is architect.

Berliner-Joyce Aircraft Corporation, care of Henry Berliner, head of Berliner Aircraft Co., Alexandria, Va., recently organized to take over last noted company, has plans for new plant on 5½-acre tract at municipal airport, Baltimore, including parts and assembling departments for production of multi-passenger and other airplanes. New plant will cost about $250,000, of which $100,000 will be expended for machinery. Present Berliner plant will be removed to new site. Completion is scheduled in May. To provide for project and operations, company has disposed of stock issue totaling $1,000,000. Temple N. Joyce and Mr. Berliner are vice-presidents, in charge of production.

Hopewell Sheet Metal Works, Inc., Hopewell, Va., has awarded general contract to C. D. Hughes, Hopewell, for one-story plant, to cost about $25,000 with equipment. Osbert K. Edwards, Elder Building, is architect.

Goodyear Tire & Rubber Co., Akron, Ohio, plans expansion and improvements in branch mill at Cedartown, Ga., including installation of additional machinery, to cost about $550,000.

Hydro-Electric Corporation of Virginia, affiliated with Virginia Public Service Co., Charlottesville, Va., has disposed of bond issue of $800,000, proceeds to be used for new hydro-electric generating plant on James River, near Glasgow, Va., on which work is under way. New station will be equipped for capacity of 12,500 hp., and will be operated by Virginia company.

National Sash Weight Corporation, Baltimore, has been formed under State laws with capital of 12,000 shares of preferred and 43,000 shares of common stock, to take over and consolidate Levering Brothers, 200 Key Highway, Baltimore; E. E. Brown & Co., Darby, Pa.; Carteret Foundry Co., 2 Pacific Avenue, Jersey City, N. J., with branch foundry at Boonton, N. J.; and Borough Foundry Co., Inc., 280 North Henry Street, Brooklyn, N. Y. Consolidated company is arranging

financing and plans expansion at different units.

Richmond Car Works, Inc., Richmond, Va., a subsidiary of Standard Steel Car Co., Frick Building, Pittsburgh, has work in progress on expansion program, to cost about $500,000 with equipment, to include truck, wheel and axle shop, machine shop, and other units. Engineering department of parent organization is in charge.

Evens & Howard Fire Brick Co., 920 Market Street, St. Louis, is said to have plans for expansion in branch plant at Stevens Pottery, Ga., recently acquired, to cost more than $50,000.

Richland Power Co., Columbia, S. C., care of O. Y. Owings, Jr., 1002 Elmwood Avenue, recently formed by Mr. Owings and associates, is reported planning construction of hydroelectric generating plant on Saluda River, near Columbia, with initial capacity of 30,000 hp. and ultimate output of about twice that amount, to cost over $450,000 with transmission system.

Pittsburgh

PITTSBURGH, Feb. 25.—Machine tool sales are making a good showing in the aggregate, but are not in keeping with the number of inquiries, nor with expectations based upon the interest which developed in December and January. Requirements for the new plant of the A. M. Byers Co., Ambridge, Pa., have not yet been determined, purchases not having gone beyond cranes and mills. The Westinghouse Electric & Mfg. Co. has only a few tools in its first quarter list left to place.

Gulf Refining Co., Frick Annex, Pittsburgh, has plans for new oil refinery on 1000-acre tract near Sweetwater, Tex., to handle 5000-bbl. crude oil per day. Project will include gasoline refinery with cracking capacity of 4000 bbl. daily. Entire development is reported to cost more than $3,500,000.

Horix Mfg. Co., Pittsburgh, has been organized to take over and expand company of same name, with plant at Chartiers and Olliffe Streets, manufacturer of iron and steel products. T. E. Shaw and E. C. McHugh head new company.

Altoona Aircraft Co., Altoona, Pa., plans extensions and improvements in airport hangars, shops and other structures, to cost about $30,000.

Board of Education, Parkersburg, W. Va., plans installation of manual training equipment in new junior high school to cost $500,000. Special election has been called March 19, to vote bonds in such amount. Warne, Tucker, Silling & Hutchison, Masonic Temple, Charleston, W. Va., are architects. T. T. Stansbury, Guaranty Building, Parkersburg, is associate architect.

Huntington Seating Corporation, Huntington, W. Va., has been formed to take over and expand Huntington Seating Co., with local plant, and contemplates increase in capacity. New company has capital of $300,000. W. M. Jones is president.

Hazel-Atlas Glass Co., Conservative Life Insurance Building, Wheeling, W. Va., has taken bids on general contract for four-story addition to plant at Washington, Pa., for storage and distributing service, including conveying and other mechanical handling equipment, to cost $200,000.

P. C. Weller, 1431 Kelton Avenue, Dormont, Pa., and associates, have organized Pittsburgh Flasher Co., with capital of $25,000, and plan establishment of factory at Pittsburgh to manufacture electric flashing equipment and other electrical services. J. W. Wicks, 2323 Beechwood Boulevard, Pittsburgh, is also interested in company.

Buffalo

BUFFALO, Feb. 25.—City Council, Niagara Falls, N. Y., has awarded contract to Wright & Kremers, Inc., Pine Avenue and Main Street, for municipal airport near Tuscarora Road and Niagara Falls Boulevard, including hangar, with repair and reconditioning facilities, and other building, to cost more than $75,000 with equipment. Completion is scheduled early in May. Kirkpatrick & Cannon, 503 Third Avenue, are architects.

Multicell Radiator Corporation, Buffalo, care of Frank A. Abbott, Iroquois Building, attorney and representative, recently organized with capital of $1,000,000, is negotiating for site for new plant to manufacture copper radiators and heating systems for factories, initial unit to cost about $100,000 with equipment.

International Business Machines Corporation, Binghamton, N. Y., manufacturer of calculating and accounting machines and parts, is carrying out an expansion program, including installation of new equipment.

Syracuse Bronze Co., Syracuse, N. Y., recently organized by Ernest R. Cook, 319 West Genesee Street, and associates, plans operation of local factory to manufacture brass, bronze and aluminum goods. George P. Sawyer, Baldwinsville, N. Y., is also interested in new company.

City Council, Buffalo, has approved an appropriation of $115,000 for improvements at municipal airport, including construction of central steam heating plant, repairs and betterments in hangars, shops and other buildings. Purchase of 37-acre tract adjoining has also been authorized, to be used for development of airport; construction of hangars, repair shops and other buildings by several private interests now negotiating for sites. James P. Moore, parks commissioner, in charge.

Kirkpatrick & Cannon, 503 Third Avenue, Niagara Falls, N. Y., architects, have plans for four-story automobile service, repair and garage building, to cost about $300,000 with equipment.

Kelker Blower Co., Inc., Buffalo, has moved to 19 Bush Street.

Detroit

DETROIT, Feb. 25.—Contract has been let by Michigan Steel Tube Products Co., Holbrook and Buffalo Avenues, Detroit, to Krieghoff Co., 6601 French Road, for one-story addition, to cost about $50,000 with equipment. Christian W. Brandt, 2111 Woodward Avenue, is architect.

Hoskin-Morainville Paper Co., Menominee, Mich., is planning a one-story addition to mill for Bates valve bag division, to cost more than $60,000 with equipment.

Olds Motor Works, Lansing, Mich., has plans for two-story addition, 85 x 315 ft., to cost about $160,000 with equipment. Verner, Wilhelm & Molby, Book Building, Detroit, are architects.

Lefere Forge & Machine Co., Jackson, Mich., recently organized by Alidor Lefere, Jackson, formerly president of Riverside Forge & Machine Co., with local plant, has taken over nine-acre tract on Grand River, and plans early construction of new works to manufacture automobile parts and kindred forgings. Initial plant will comprise five one-story units, including main forge shop, tool and die shop, boiler plant, garage and service building, and will cost about $100,000 with equipment. Mr. Lefere will be president and general manager; and E. C. Hetherwick, secretary and treasurer.

Merger has been approved of Square D Co., 6060 Rivard Street, Detroit, manufacturer of electric switches and controls, and Industrial Controller Co., Milwaukee, manufacturer of kindred products. Both plants will be continued as heretofore and expansion in output is planned.

Marvel Carburetor Co., Flint, Mich., has awarded general contract to W. E. Wood & Co., Ford Building, Detroit, for addition to cost about $60,000 with equipment.

Packard Motor Car Co., 1580 East Grand Boulevard, Detroit, has plans for new multi-story unit for production of Diesel-type aircraft engine, including parts and assembling departments, to cost about $650,000 with equipment. It is purposed to have plant ready for service late in May.

AC Spark Plug Co., Flint, Mich., has plans for a two-story addition, to cost about $30,000 with equipment.

Department of Public Works, City Hall, Detroit, is revising plans and will ask new bids on general contract for municipal airport, consisting of hangars, repair shops, oil storage and other buildings. Entire project will cost about $1,500,000. Louis Kemper, 3729 Cass Avenue, is architect.

Detroit Steel Products Co., 2250 East Grand Boulevard, Detroit, has arranged for a new stock issue to total about $1,260,000, part of proceeds to be used for expansion.

Cogsdill Mfg. Co., Detroit, has been organized to manufacture metal-cutting tools. Plant has been constructed especially for company's purposes and no purchases of equipment are contemplated. S. A. Cogsdill is president.

Cleveland

CLEVELAND, Feb. 25.—Machine tool demand continues brisk, although no round lot orders were placed the past week. Business is coming from well diversified sources, although the automotive industry is supplying the bulk of orders. The Hupp Motor Car Corporation, Detroit, which recently purchased considerable equipment for its subsidiary, the Atlas Mfg. Co., Fostoria, Ohio, has an inquiry out for multiple spindle drilling machines for its Chandler-Cleveland plant in this city. Turret lathes are still in heavy demand, and a local manufacturer expects that its February sales will break all records. Presses are moving well. A Cleveland company during the week placed an order for several presses for plant extensions.

Plans have been filed by American Coach & Body Co., 3809 Clark Avenue, Cleveland, for one-story addition to automobile body works, 60 x 200 ft., to cost about $60,000 with equipment.

Bingham Stamping & Tool Co., 1062-66 Post Street, Toledo, Ohio, has awarded general contract to H. J. Speiker Co., Elm

and Utica Streets, for two-story factory, to cost about $40,000 with equipment. Bollinger & Hayes, 320 Ontario Street, are architects.

Church Budget Enevlope Co., Salem, Ohio, has awarded general contract to Lutz Construction Co., Canton, Ohio, for one and two-story factory to cost about $75,000 with equipment.

Thompson Products Co., 2196 Clarkwood Road, Cleveland, manufacturer of bolts, valves and other automotive equipment, has plans for four-story addition, to cost about $160,000 with machinery. Robert Wright Co., Swetland Building, is architect. Company will also carry out expansion at Detroit, comprising two plant units, to cost close to $1;000,000 with equipment.

Geometric Stamping Co., 221 East 131st Street, Cleveland, manufacturer of metal stampings, etc., is disposing of bond issue of $350,000, part of fund to be used for general expansion.

Manufacturers' Brush Co., 1950 West 114th Street, Cleveland, has awarded general contract to R. W. Kretchner, 3700 West 130th Street, for one-story addition, 75 x 235 ft., to cost about $70,000 with equipment. F. Stewart Porte, Mantua, Ohio, is architect.

Sweinhart Tire & Rubber Co., Akron, Ohio, has purchased plant and business, exclusive of real estate, of Erie Rubber Corporation, Sandusky, Ohio. Purchasing company will discontinue operations at Sandusky and will concentrate manufacture at Akron works, which will be developed for increased output.

Union Malleable Mfg. Co., Ashland, Ohio, maker of malleable iron pipe fittings, has plans for two-story addition, containing 10,000 sq. ft., to house additional machinery and shipping space. Lawrence N. Russell is architect, and erection of new building will commence about April 1.

Chicago

CHICAGO, Feb. 25.—The spotty character of the local machine tool market continues, and dealers now estimate February sales at 60 to 70 per cent of the January volume. The pending list is still large, but is moving slowly. The railroads are tabulating bids and from time to time send out inquiries for small lots. Promise of new large business comes from several Chicago steel mills and the Nash Motors Co., Kenosha, Wis., which are making close studies of requirements.

Demand for used machine tools is steady, but supplies are short, and much that is available is unsuitable for buyers' needs. The bulk of current sales and inquiries is coming from well diversified industries.

Contract has been let by Sundstrand Machine & Tool Co., 2531 Eleventh Street, Rockford, Ill., to Linden & Sons, 1110 Tenth Street, for one-story addition, to cost more than $35,000 with equipment.

Board of Education, Blue Island, Ill., is considering installation of manual training equipment in new two-story high school addition, to cost $350,000, for which bids have been asked on general contract. Perkins, Chatten & Hammond, 160 North La Salle Street, Chicago, are architects.

Zimmerman Cut Stone Co., 7008 Cottage Grove Avenue, Chicago, is planning construction of one-story plant, totaling about 27,000 sq. ft. floor space for cutting, polishing, finishing and other departments, to cost about $55,000 with equipment.

Thieman Mfg. Co., Albert City, Iowa, manufacturer of farming implements, is considering one-story branch plant at Fort Dodge, Iowa, to cost about $30,000 with equipment.

City Council, Great Falls, Mont., is considering construction of municipal machine shop for repair of city-owned automobiles. M. L. Morris is city engineer.

Colorado & Southern Railway Co., 909 Seventeenth Street, Denver, Colo., is considering extensions and improvements in local engine house and shops, to cost about $75,000 with equipment.

City Council, Luverne, Minn., D. W. Campbell, city recorder, is asking bids until March 14, for two watertube boilers, 160 lb. working pressure; two stokers, and accessory equipment.

Board of Education, Wayland, Iowa, has authorized installation of manual training equipment in three-story high and grade school to cost about $100,000, for which bids have been asked on general contract. Raymond F. Moore, Merchants' National Bank Building, Cedar Rapids, Iowa, is architect.

Chicago Extruded Metals Co., 1642 South Fifty-fourth Avenue, Cicero, Ill., has acquired 150,000 sq. ft. additional property for future expansion.

Board of Village Trustees, Beulah, N. D., is asking bids until March 5 for equipment for a municipal waterworks, including two pumping units, with auxiliaries, one 75,000-gal. steel tank on 100-ft. steel tower, valves and miscellaneous equipment. F. O. Gentz is village clerk; T. R. Atkinson, Bismarck, N. D., is engineer.

Viking Pump Co., Cedar Falls, Iowa, maker of rotary pumps, is planning merger with Falls Foundry Co. and Banner Brass Co., both of Cedar Falls, which manufacture fittings for Viking company.

Headford Brothers & Hitchins Foundry Co. and Hawkeye Foundry Co., both of Waterloo, Iowa, have been consolidated, and capital stock of Headford concern has been increased from $75,000 to $200,000 to provide funds for expansion. Combined companies will have annual capacity of 7500 tons of castings. Edward H. Headford is president of new company; Frank O. Hitchins and William T. Headford, vice-presidents, and W. E. Robinson, secretary-treasurer.

Milwaukee

MILWAUKEE, Feb. 25.—Orders for machine tools continue at a relatively high rate, and few builders are able to make headway on deliveries, most shops being further behind than at any time since the present buying movement began. Business as well as inquiry is coming from a variety of sources, and covers virtually the entire metal-working field.

Public Utilities Commission, city of Manitowoc, Wis., 817 Franklin Street, is asking bids until March 14 for furnishing and installing two 800-hp. boilers, 400 lb. pressure, with stokers or pulverized fuel firing equipment, and one 5000-kw. turbo-generator with condenser and auxiliary equipment. Appropriation for improvement to municipal light and power plant is $250,000. A. H. Zander is city clerk.

Globe Electric Co., 14-28 Keefe Avenue, Milwaukee, manufacturer of storage batteries, radio sets, etc., has placed general contract with Worden-Allen Co., local, for one-story addition, 150 x 200 ft. Investment in building and equipment will be about $100,000.

A. T. Harrington, 1036 Williamson Street, Madison, Wis., has started work on construction of a welding shop, 40 x 75 ft.

E. C. Stryberg, 2219 DeKoven Avenue, Racine, Wis., is building a one-story machine shop addition, 37 x 63 ft.

Metal Stamping Corporation, West Bend, Wis., manufacturer of automobile stampings, contemplates erection of a new shop containing about 20,000 sq. ft. Details have not been determined upon. C. P. Davey is general manager.

American Lace Paper Co., 908 Juneau Avenue, Milwaukee, has plans by Richard Philipp, architect, 405 Broadway, local, for a four-story factory, 82 x 320 ft., to cost about $200,000. Die-sinking, die-cutting, embossing and other special equipment will be required.

Cooper-Kumpf Mfg. Co., Racine, Wis., has been organized by Arthur H. Kumpf, 1815 St. Clair Street, and Frank Cooper, 800 Lake Avenue, to manufacture electrical appliances and fractional horse power motors. A building has been leased and inquiry is being made for equipment.

American Black Granite Co., Minneapolis, has acquired the former blast furnace plant of the Charcoal Iron Co. of America, at Ashland, Wis., and will invest about $350,000 in remodeling and re-equipping it as a polishing and shipping plant to serve a recently developed granite quarry at Mellen, near Ashland.

Cincinnati

CINCINNATI, Feb. 25.—For some local machine tool companies February has been a better month than January. One large builder reports an increase in bookings amounting to almost 100 per cent, while another reached the highest level, in volume of orders, since 1919. Numerous other manufacturers have had heavy sales, with the result that bookings in February, considering the entire local market, will surpass those of January by at least a small margin. Although much of the current business has originated in the automobile industry, buying has been well distributed among all consuming lines. Railroads are showing signs of increased interest in the purchase of machine tools. The Baltimore & Ohio has bought a few items, and the Chesapeake & Ohio has contracted for a carwheel borer.

The problem of making deliveries is constantly becoming more acute. On some types of tools local builders cannot fill orders until May and June, although the general average of deliveries probably ranges from six to eight weeks.

Authorized Ford Distributors, Inc., Cincinnati, C. H. Biederman, president, local representative for Ford automobiles, will soon begin superstructure for three-story service, repair and sales building, to cost about $125,000 with equipment. Parkway Construction Co., Provident Bank Building, is architect and engineer.

Frigidaire Corporation, Third National Bank Building, Dayton, Ohio, manufacturer of electric refrigerating equipment, has awarded general contract to Danis-Hunt Co., Dayton, for one-story addition to cost about $35,000 with equipment.

Nashville, Chattanooga & St. Louis Railway Co., Nashville, Tenn., plans addition to engine house, with repair facilities, to cost about $37,000.

Johnson City Foundry & Machine Works, Johnson City, Tenn., has acquired plant and business of Watauga Extract Co., Elizabethton, Tenn., and will remove to Johnson City works, which will be developed to accommodate increase.

Leland Electric Co., 218 North St. Clair Street, Dayton, Ohio, manufacturer of fractional horsepower motors, has taken out a permit for an addition, to cost about $250,000 with equipment, for which general contract recently was let to Charles H. Shook, Inc., Dayton.

Red Cap Battery Co., Louisville, manufacturer of electric batteries, has taken over building on Breckinridge Street, and will remodel for new plant with output of about 400 battery units daily, to cost $40,000.

Tennessee Products Co., Nashville, Tenn., is planning an expansion and improvement program at gas plant and by-product coke works at Chattanooga, Tenn., with additional equipment for production of tar, benzol, ammonia, etc., to cost about $500,000.

Sterling Wood Products Co., Knoxville, Tenn., manufacturer of automobile body parts, has awarded general contract to J. M. Dunn & Co., 245 Broad Street, for one-story addition, 175 x 215 ft., to cost more than $125,000 with equipment.

Murray Corporation of America, Inc., Detroit, manufacturer of automobile bodies, has awarded general contract to Rock City Construction Co., 150 Fourth Avenue North, Nashville, Tenn., for plant at Memphis, Tenn., to cost over $2,000,000 with equipment.

Northside Pattern & Foundry Co., 3616 Colerain Avenue, Cincinnati, has been organized to succeed Buckeye Pattern Works, manufacturer of wood and metal patterns. New company has erected addition, now in operation, to manufacture brass and aluminum castings.

James Clark, Jr., Co., 520 West Main Street, Louisville, Ky., purchase of which by Lake States General Electric Co., Columbus, Ohio, was mentioned in THE IRON AGE of Jan. 31, was jobber and not manufacturer of electrical supplies and equipment. James Clark, Jr., Electric Co., 600 East Bergman Street, Louisville, continues as manufacturer of electrically driven tools, with James Clark, Jr., as president.

Indiana

INDIANAPOLIS, Feb. 25.—Plans are being completed by Absolute Con-Tac-Tor Co., Elkhart, manufacturer of automatic electric control devices, etc., for one-story addition, to cost about $65,000 with equipment. Hubert Miller, Monger Building, is architect.

Pierce Governor Co., Anderson, manufacturer of engine governors, etc., is arranging for expansion in connection with an automatic choke for automotive service, a recent development, and will increase facilities to manufacture from 250 to 500 units per day.

Chrysler Corporation, East Jefferson Avenue, Detroit, has plans for addition to branch automobile plant at Newcastle, one story, 160 x 360 ft., to cost more than $175,000 with equipment. Unit will be used for expansion in machine and assembling departments.

Board of Education, Gary, plans installation of manual training equipment in Lew Wallace High School in Glen Park district, to cost $900,000, for which plans are being drawn by William B. Ittner, Board of Education Building, St. Louis, architect.

Loshbough-Jordan Tool & Machine Co., Elkhart, is planning to rebuild part of plant destroyed by fire Feb. 19.

Indianapolis Power & Light Co., Indianapolis, is planning construction of superpower steam-operated electric generating plant on White River, about five miles from city, with initial capacity of 70,000 kw., to cost more than $5,000,000 with transmission lines. Later output will be increased to 140,000 kw., total plant representing investment of more than $11,000,000. Company is a subsidiary of Utilities Power & Light Corporation, 327 South La Salle Street, Chicago.

Faultless Sash Holder Co., Inc., Indianapolis, care of H. A. Busby, 20 East Twenty-second Street, recently formed by Mr. Busby and associates, is planning establishment of local factory to manufacture automatic window sash equipment, to cost about $25,000 with machinery. Branch plants are contemplated at Chicago and Louisville.

Roxana Petroleum Corporation, Shell Building, St. Louis, has approved plans for one-story oil storage and distributing plant, 30 x 160 ft., at Indianapolis, to cost about $40,000 with equipment.

Perfect Circle Piston Ring Co., Hagerstown, Ind., has announced three-year building program to begin immediately with construction of three-story concrete structure to provide 18,000 sq. ft. of floor space. It will be used exclusively for storage and will be completed in 60 days. Second unit will be added in six months.

Gulf States

BIRMINGHAM, Feb. 25.—Bennett Pump Corporation, Muskegon, Mich., has leased building at 2208 South Harwood Street, Dallas, Tex., for factory and distributing branch. Company is considering early construction of new plant at that place to manufacture oil station equipment, tanks, etc.

Robinson-Slagle Lumber Co., Shreveport, La., is having plans drawn for one-story wood-working plant, with electrically-operated machinery, to cost about $30,000. Clarence W. King, Giddens-Lane Building, is architect.

Texas Gypsum Products Co., Finlay, Tex., recently formed by Frank Akerman and associates, will proceed with construction of mill near local gypsum deposits, for manufacture of wallboard, hollow tile, and other gypsum building materials, to cost more than $150,000 with machinery.

Brown Paper Mill Co., Monroe, La., manufacturer of kraft paper stocks, has engaged George F. Hardy, 309 Broadway, New York, paper mill engineer, to prepare plans for a one-story addition, to cost about $100,000 with equipment.

Florida Power Corporation, St. Petersburg, Fla., is disposing of bond issue of $9,000,000, part of proceeds to be used for expansion.

International Harvester Co., 931 North Twenty-fourth Street, Birmingham, has asked bids on general contract for extensions in local factory branch and distributing plant for motor truck division and other service, consisting of three-story unit, 75 x 100 ft., and one-story building, 115 x 116 ft., to cost more than $125,000 with equipment. Headquarters are at 606 South Michigan Avenue, Chicago.

City Council, Daytona Beach, Fla., has leased 90-acre tract on Halifax River, for establishment of municipal airport, including hangar, repair and reconditioning shops, oil storage and other buildings. Pitcairn Aviation, Inc., Land Title Building, Philadelphia, will use field in connection with air-mail contract from Daytona Beach to Atlanta, Ga., and will establish terminal hangar, shops, etc. Entire project will cost more than $100,000.

John Morrell & Co., 120 North Water Street, Mobile, Ala., meat packers, have plans for new one-story packing plant, 90 x 100 ft., with refrigerating, conveying and other equipment, to cost about $50,000. Henschien & McLaren, 1637 Prairie Avenue, Chicago, are architects and engineers. Headquarters are at Ottumwa, Iowa.

Industrial Gas Co., operated by Arkansas Natural Gas Co., Ardis Building, Shreveport, La., is planning natural gas plant near Alto, Richland Parish, La., with initial capacity of 100 million cu. ft. daily. It is also proposed to construct carbon black plant as auxiliary. Entire project will cost more than $200,000 with equipment.

Norvell-Wilder Hardware Co., 1302 Nance Street, Houston, Tex., has work under way on one-story storage and distributing plant, 150 x 200 ft., to cost about $65,000 with mechanical handling equipment. F. W. Steinman & Son, San Jacinto Life Building, Beaumont, Tex., are architects and engineers.

Gulf Pipe Line Co., Fort Worth, Tex., subsidiary of Gulf Oil Corporation, same city, is arranging for construction of new pipe line from Midland, Tex., to Hendrick field, Winkler County, about 80 miles, to cost more than $250,000 with booster stations.

State Building Commission, New State Capitol, Jackson, Miss., W. C. Trotter, secretary, is asking bids until April 4 for a power plant at State Teachers' College, Hattiesburg, Miss., until April 18 for addition to power house and mechanical laundry at Mississippi Industrial and Training School, Columbia. Vinson B. Smith, Jr., Bank of Gulfport Building, Gulfport, Miss., is architect for both projects.

St. Louis

ST. LOUIS, Feb. 25.—Metalcraft Corporation, 1501-15 Penrose Avenue, St. Louis, manufacturer of metal toys and novelties, has begun work on one-story addition to cost about $75,000 with equipment, for which general contract recently was let to Schooley & Chambers Co., 6038 Delmar Avenue.

Eagle-Picher Lead Co., Joplin, Mo., is said to be planning addition to smelting plant at Ontario, Okla., to cost about $100,000 with equipment.

City Council, Harrisonville, Mo., has plans for municipal electric light and power house, to cost more than $65,000 with machinery. Rollins & Co., Railway Exchange Building, Kansas City, Mo., are engineers.

City Council, Pawhuska, Okla., is arranging fund of $50,000 for establishment of municipal airport, including hangars, repair shops, oil storage and other buildings.

C. A. Mayo, 1413 South Cheyenne Street, Tulsa, Okla., is at head of project to construct and operate seven-story automobile service, repair and garage building, 100 x 140 ft., to cost over $150,000 with equipment. H. F. Wilcox, 310 West Sixth Street, is also interested in project.

Missouri Farmers' Association, E. A. Davis, 540 Benton Avenue, Springfield, Mo., manager, has engaged Southwest

Engineering Co., McDaniel Building, engineer, to prepare plans for grain mills and elevator, to cost about $100,000 with elevating, conveying, screening and other equipment.

Merger has been completed by Hussmann Refrigerator Co., 911 North Broadway, St. Louis; Steiner Mfg. Co., 4100 North Twenty-first Street, manufacturer of electrical equipment and devices; and Ligonier Refrigerator Co., Ligonier, Ind. Consolidated company will have assets of about $3,000,000, and will specialize largely in manufacture of butchers' equipment and supplies. Present plants will be continued and capacity increased.

Pokorny & Co., Inc., 1301 Washington Avenue, St. Louis, manufacturer of furniture, has filed plans for five-story plant, 60 x 100 ft., to cost about $140,000 with equipment.

Braley School of Flying, York Rite Temple Building, Wichita, Kan., will begin construction of airport and flying school at municipal air field, consisting of hangar, 50 x 300 ft., with repair shop, administration building, 100 x 150 ft., and other structures, to cost about $130,000 with equipment.

Ramp Auto Hotel Co., Oklahoma City, Okla., has awarded general contract to Charles M. Dunning Construction Co., 420 North Hudson Street, for eight-story and basement service, repair and garage building, 75 x 150 ft., to cost about $275,000 with equipment.

Yunker Aircraft Corporation, Dodge City, Kan., George Yunker, president, is said to have plans for one-story plant, for parts and assembling, to cost about $35,000 with equipment.

Pacific Coast

SAN FRANCISCO, Feb. 21.—Following completion of new assembling plant near Los Angeles, Willys-Overland Co., Toledo, Ohio, is arranging for additional buildings to double present capacity, to cost more than $500,000 with equipment. Initial unit consists of four buildings, totaling 300,000 sq. ft. floor space, and was opened Feb. 20. J. A. Sheldon is company engineer in charge of plant construction. J. V. McNeil Co., 5860 Avalon Boulevard, Los Angeles, general contractor for present plant, will receive award for additional buildings.

City Construction Department, City Hall, Los Angeles, has plans for hangar at municipal airport near Inglewood-Redondo Boulevard, 100 x 230 ft., with shop facilities for repairs, to cost about $40,000 including equipment.

Simmons Co., Kenosha, Wis., manufacturer of brass and iron bedsteads, etc., is planning for second unit at factory branch and distributing plant at San Francisco, to be three stories and to cost about $50,000. Ellison & Russell, Pacific Building, San Francisco, are architects. Local headquarters are at 295 Bay Street.

Robinson Gear & Machine Works, 2917 First Avenue South, Seattle, has awarded general contract to H. D. Stewart, Dexter-Horton Building, for two-story machine shop, 60 x 85 ft., to cost about $25,000 with machinery.

City Council, Tacoma, Wash., has retained Casseday Engineering & Construction Co., Smith Building, Seattle, to prepare plans for proposed municipal grain elevator, with elevating, conveying, screening and other equipment, to cost $500,000. Work will begin in about 60 days. C. E. Putnam is city engineer, in charge.

Board of Education, Los Angeles, will build two-story vocational shop, 60 x 135 ft., at new junior high school group at 320 North Record Street, to cost about $150,000, for which bids have been asked on general contract. Edgar H. Cline, Petroleum Securities Building, is architect.

Southwest Welding & Machine Co., 625 North Main Street, Los Angeles, has awarded general contract to Consolidated Steel Corporation, 1200 North Main Street, for one-story plant, 100 x 160 ft., at Alhambra, to cost about $35,000 with equipment.

Contract has been let by Continental Can Co., 1 Pershing Square, New York, to Scofield-Twaits Co., Pacific Finance Building, Los Angeles, for three-story plant at Oakland, Cal., to cost about $550,000 with equipment. Francisco & Jacobus, Pershing Square Building, New York, are architects and engineers.

Canada

TORONTO, Feb. 25.—Several good sized machine tool orders were placed the past week and considerable other business is pending for extensions to industrial plants. The automotive industry is buying on a substantial scale for both replacement needs and new works. Railroad car and locomotive shops have been in the market with orders from one to a half dozen tools. The proposed plant at Tecumseh, Ont., for the Canadian Northern-Wabash railroads will involve the purchase of considerable equipment during the year. Among contracts placed the past week was one to the Mead-Morrison Co., Ltd., Montreal, for unloading equipment costing $220,000 for the coal dock at Michipicoten, Ont., for the Algoma Central & Hudson Bay Railway Co.

James, Proctor & Redfern, Ltd., Toronto, is preparing plans for a $300,000 waterworks plant at North Bay, Ont. Tenders for building and equipment will be called as soon as plans have been completed.

Canadian Elevator Equipment Co., 94 Sherbourne Street, Toronto, has appointed Ross & MacDonald, 1 Belmont Street, Montreal, to prepare plans for a new plant at Eastern Avenue and Heward Street, Toronto.

Toronto Iron Works, Ltd., Eastern Avenue, Toronto, is having plans prepared by E. H. Darling, 72 James Street North, Hamilton, Ont., for new plant to cost $500,000.

Bids will be called immediately for a factory at Dufferin and Geary Avenue, Toronto, for the Prest-O-Lite Storage Battery Co., Ltd., to be two stories, 80 x 300 ft.

City Council, Hull, Que., contemplates building a municipal power plant to cost $50,000.

Gadbois & Perreault, 10 James Street West, Montreal, will prepare plans for a factory at Cap de la Madeleine, to cost $200,000 for the Canadian T. S. R. of Lyons, Ltd., 236 Lemoine Street, Montreal. Work will be started in April.

Hull Match Co., Ltd., care of Emile Paquette, Hull, Que., has purchased local site for erection of a match factory to cost $100,000, construction to start in spring.

Moncton Cold & General Storage, Ltd., care of Sargent-Howard-Latourelle, Ltd., 6 Craig Street West, Montreal, will build a five-story and basement cold storage plant, 100 x 300 ft., at Moncton, N. B., to cost $200,000, for which tenders are being received by William H. Wardwell, engineer, 1463 Union Street, Montreal.

McColl Brothers, Toronto, will build addition to their oil refinery to cost $200,000.

Kingston Shipbuilding Co., Kingston, Ont., will spend $60,000 on addition to plant and equipment.

Western Canada

Town Council, Stettler, Alberta, has awarded contract to Nelson River Construction Co., 607 Union Trust Building, Winnipeg, for a sewage disposal plant to cost $60,000. Equipment will be purchased later. Haddin & Miles, Ltd., 208 Oddfellows Building, Calgary, is engineer.

Precision Machine & Foundry Co., Calgary, will start work in spring on a foundry to cost $120,000. Complete equipment will be purchased.

Foreign

MINISTRY of Public Works, Bogota, Colombia, is asking for bids until March 19 for three caterpillar tractor shovels, each one-third cu. yd. capacity, petrol driven; until March 20 for one 70-ft. railroad turntable, as per specifications on file.

Ford Motor Co., Highland Park, Detroit, has plans for large automobile and Fordson tractor plant in Russia, in accordance with concession granted by Soviet Russian Government, to include parts and assembling departments, to cost more than $600,000.

Southern Cities Utilities Co., 1612 Market Street, Philadelphia, has arranged for purchase of electric and gas properties on island of Mallorca, near Barcelona, Spain, and plans expansion, including additional power facilities, transmission lines, power substations and auxiliary construction. Company also operates Porto Rico Gas & Coke Co., Porto Rico; Compania Electrica de Santo Domingo, San Domingo, and other foreign utilities.

Decca Record Co., Ltd., London, England, has been formed to take over and expand plant of Gramophone Record Co., New Malden, England, manufacturer of portable and other talking machines, records, etc. Company has arranged for sale of stock to total $4,875,000, part of proceeds to be used for development and increased output. J. H. Balfour is managing director.

Compania Transaerea Colon, Buenos Aires, Argentina, has secured a concession from Argentine Government for construction and operation of large airport near city, to include hangars, repair and reconditioning shops, oil storage and other buildings, to cost more than $80,000 with equipment. Bids will be asked soon on general contract.

Officials of Kolster Radio Corporation, 200 Mount Pleasant Avenue, Newark, N. J., are organizing subsidiary, to be known as Kolster-Brandes, Ltd., to take over foreign manufacturing and sales rights of Kolster company. A stock sale is being arranged, part of fund to be used for production facilities.

Supreme Economic Council, Soviet Russion Government, Moscow, has authorized construction of new steam-operated electric power plant for Moscow Province, to develop ultimate capacity of 150,000 kw. Two propositions are under consideration covering such a station, to use coal as fuel in Podmoskovny district, and other to utilize peat as fuel, located in Bobrikov section. Amtorg Trading Corporation, 165 Broadway, New York, is official buying agency for Soviet Russian Government in United States.

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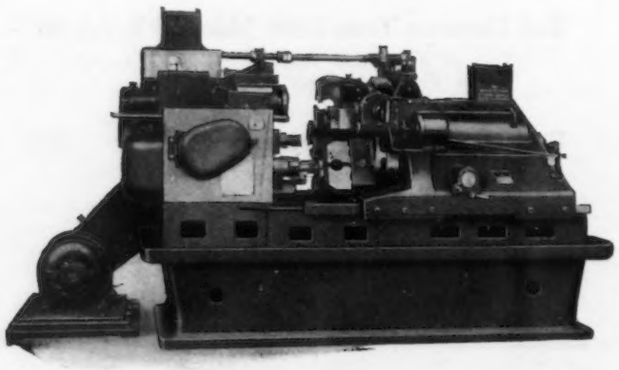

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